A Rare Plant Survey of the Wainwright Dunes Ecological Reserve

Resource Data Branch, Strategic Corporate Services

Alberta
SUSTAINABLE RESOURCE
DEVELOPMENT

A RARE PLANT SURVEY
OF THE
WAINWRIGHT DUNES
ECOLOGICAL RESERVE

by

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for

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EXECUTIVE SUMMARY

The Wainwright Dunes Ecological Reserve is administered by Alberta Community Development, Parks and Protected Areas Branch. Its 2 821 ha present a provincially significant landform of sand dune ridges, alkaline seeps and lake basins, and patterned fens which provide habitat for 19 provincially rare vascular plant species with provincial conservation Ranks within Alberta of S1, S1S2, S2, S2S3, S3W. This report presents the findings of a three phase, 20-day long, on-site inventory of rare plants in order to confirm their previously reported locations, populations and habitats, and to discover and document additional species locations within the Reserve.

Eleven previously known rare species from the Ecological Reserve were relocated, and additional locations were discovered within (indicated by IN) and outside of (indicated by (OUT)) the Reserve boundaries, as follows (? indicates taxonomic problem):

S1S2	*Carex parryana* var. *parryana* (Parry's sedge) – IN: 10 species locations with 12 621 plants (OUT: 4 species locations with 11 025 plants)
S2	*Muhlenbergia asperifolia* (scratch grass) – IN: 3 species locations with 72 780 plants (OUT: 4 species locations with over three million plants)
S2	*Carex crawei* (Crawe's sedge) – IN: 0 species location with 0 plants (OUT: 1 Species locations with 13 plants)
S2	*Cyperus schweinitzii* (sand nut-grass) – IN: 15 species locations with 9 123 plants
S2	*Lycopus americanus* (American water-horehound) – IN: 16 species locations with 887 plants (OUT: 1 species location with 15 plants)
S2	*Aster pauciflorus* (few-flowered aster) – IN: 9 species locations with 551 plants (OUT: 1 species location with 6,000 plants)
S2	*Shinneroseris rostrata* (annual skeletonweed) – IN: 18 species locations with 257 plants
S2S3	*Gentiana fremontii* (marsh gentian) IN: 2 species locations with 3 plants (OUT: 4 species locations with unknown number of plants)
S3W	*Asclepias ovalifolia* (low milkweed) – IN: 16 species locations with 1 317 plants
SU	*Eleocharis ?elliptica* (slender spike-rush) – IN: 1 species location with about 6 plants

SU *Chenopodium ?leptophyllum* (narrow-leaved goosefoot) – IN: 7 species locations with 164 plants

Eight species that were reported in previous biophysical and other studies within or adjacent to the reserve could not be relocated, and hence, no new species information is available, as follows:

S1 *Elodea ?bifoliata* (two-leaved waterweed) 1 former species location with unknown number plants
S1S2 *Najas flexilis* (slender naiad) 1 former species location with unknown number of plants
S1S2 *Ruppia cirrhosa* (widgeon-grass) 3 former species locations with unknown number of plants
S2 *Botrychium multifidum* (leather grape-fern) 1 former species location with unknown number of plants
S2 *Carex ?houghtoniana* (Houghton's sedge) 1 former species location with unknown number of plants
S2 *Drosera linearis* (slender-leaved sundew) 5 former species locations with unknown number of plants
S2 *Hedyotis longifolia* (long-leaved bluets) 1 former species location with unknown number of plants
S2S3 *Veronica catenata* (water speedwell) 1 former species location with unknown number of plants

There are notable concentrations of the rare species occur in association with the Ecological Reserve's distinctive habitats, as follows (+ indicates not recorded in 2002, ? indicates taxonomic problem) from habitats associated with the sand dune ridges (*Carex ?houghtoniana+*, *Cyperus schweinitzii*, *Chenopodium ?leptophyllum*, *Shinneroseris rostrata*), grasslands (*Asclepias ovalifolia*), forests (*Botrychium multifidum+*), seepage slopes (*Carex crawei*, *Gentiana fremontii*, *Lycopus americanus*), wetlands (*Eleocharis ?elliptica*, *Lycopus americanus*, *Veronica catenata+*), ponds (*Elodea bifoliata+*, *Najas flexilis+*), and patterned fen (*Drosera linearis*), and the David Lake basin (*Ruppia cirrhosa*, *Muhlenbergia asperifolia*, *Carex parryana* var. *parryana*, *Aster* *pauciflorus, Lycopus americanus*).

The major habitat threats to the survival of the species are related to the effects of the prolonged drought conditions, with minor grazing and very local illicit use impacts, and management concerns mostly involve monitoring these effects and conducting supplemental surveying during a moister climatic year.

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INTRODUCTION

The Wainwright Dunes Ecological Reserve (Figure 1) is located in the eastern portion of the Parkland Natural Region in Alberta, approximately 30 km SSE of the town of Wainwright, and adjacent to the southern border of the southeastern arm of CFB Wainwright. This 2 821 ha (6 970 ac.) area is an Ecological Reserve established under legislation administered by Alberta Community Development, Parks and Protected Areas, and managed in cooperation with Alberta Sustainable Resource Development, Public Lands Division.

There are no bedrock outcrops of the underlying Upper Cretaceous Belly River Formation within the Reserve (Fehr 1984). The surficial geology of the central portion of the Reserve is predominantly a gently to strongly and sharply rolling sand plain that features parallel, long ridges that are modified parabolic dunes with strongly asymmetrical arms, as well as several extensive outwash / lacustrine depressions that support organic deposits, all of which trend from northwest to southeast. A notable depressional deposit is the Great Fen, which presents patterned fen terrain features. Along the northern, western and eastern portions is a gently rolling outwash plain, with a kame moraine that has high relief in the northeastern corner. In the southeastern portion is the David Lake basin which experiences considerable drawdown during drought periods, and which in 2002 was essentially a mile square alkaline plain. Two small aeolian depressions with wetland features occur along the Reserve's eastern boundary and to the southwest of the David Lake basin (Fehr 1984). There is poor soil development with immature profile horizonation on the dry sandy terrain of the upland sites while the wetter lowland depressions support well-developed Dark Brown or Black Chernozem profiles and, in the fens, deep fibric organic soils (Fehr 1984). The David Lake basin was strongly alkaline, as is typical of many lakes in the region, and around the basin are saline seepage zones, with, under normal, non-droughty climatic conditions, a particularly active seepage complex on the north side of David Lake. David Lake is drained to the south by a creek and eventually into Ribstone Creek outside the Reserve (Fehr 1984). There are a limited number of streams and ponds in the Reserve, with the larger located to the northeast and southeast of the Great Fen.

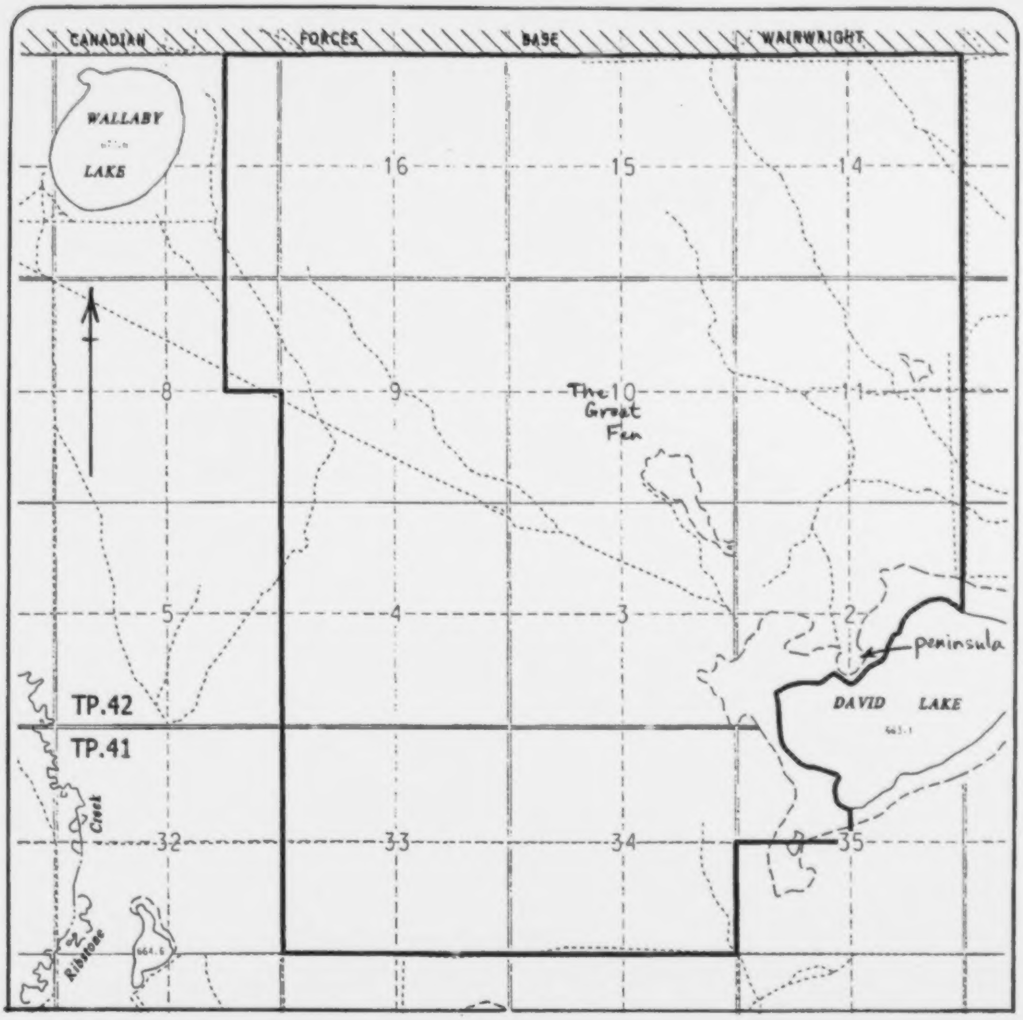
CANADIAN
FORCES
BASE
WAINWRIGHT
WALLABY
LAKE
16
15
14
8
9
The 10
Great
Fen
11
5
4
3
2
peninsula
DAVID
LAKE
TP.42
TP.41
Creek
32
33
34
35
Ribstone
664.6

Figure 2: Boundaries and geographic reference features Wainwright Dunes Ecological Reserve.

Land use within the Reserve has included several gas / oil exploration well sites and associated seismic and pipeline corridors that were installed over a decade ago, but are not actively productive at this time (Anon 1998). Grazing for cattle by local ranchers has been conducted since 1905, and has been managed by the Buffalo Park Grazing Association for the past 50 years; however, the current drought recently has reduced by half the number of cattle in the Reserve (Anon 1998, Maull 2002). The current land uses allowed within the Ecological Reserve include ongoing controlled grazing and limited public access, although vehicular use is not allowed (Anon 1998).

The vegetation of the Reserve consists of upland native grassland that extends over one third of the area, much of which experiences some degree of shrub and sapling succession. There is a distinctive xeric barrens vegetation on the blowouts along the sand ridges, aspen groves on the uplands and north-facing slopes. In the lowland depressions there are mixed balsam poplar – aspen forests, and in the wetland basins, along the stream courses and around the lake backshores, are thicket swamps and shrubby marshes including a notable development of fen vegetation in the Great Fen and local spring areas. The lake vegetation of David Lake varies from being a strongly alkaline meadow in dry years to aquatic vegetation in wet years. Most of these vegetation habitats also support the provincially rare species that are the concern of this report (Fehr 1984, Cottonwood Consultants, Ltd. 1986, Pearson Timberline Forestry Consultants 1993). A brief description of each major vegetation community follows:

The grassland communities include species that are representative of the Parkland Natural Region, such as *Bouteloua gracilis* (blue grama), *Koeleria macrantha* (June grass), *Calamovilfa longifolia* (sand grass), *Festuca campestris* (rough fescue), *Poa sandbergii* (Sandberg grass), *Stipa curtiseta* (western porcupine grass), *Carex pensylvanica* var. *digyna* (sun-loving sedge), *Selaginella densa* (prairie selaginella), *Smilacina stellata* (star-flowered Solomon's-seal), *Comandra umbellata* var. *pallida* (bastard toadflax), *Antennaria parvifolia* (small-flowered everlasting), *Solidago missouriensis* (low goldenrod), *Lithospermum incisum* (narrow-leaved puccoon) and others, including the provincially rare *Asclepias ovalifolia* (low milkweed). The upland open shrub thicket successional vegetation includes saplings of *Populus tremuloides* (aspen), and shrubs of *Prunus virginiana* (choke cherry) *Rosa acicularis* (prickly rose), *Elaeagnus commutata* (silverberry) and *Symphoricarpos occidentalis* (buckbrush).

The sand ridge blowouts often have an open cover of *Calamovilfa longifolia, Carex pensylvanica* var. *digyna, Carex obtusata* (blunt sedge), *Carex siccata* (hay sedge), *Stipa curtiseta, Sporobolus cryptandrus* (sand dropseed), *Festuca saximontana* (Rocky Mountain fescue), *Oryzopsis hymenoides* (Indian rice grass), *Rumex venosus* (wild begonia), *Chamaerhodos erecta* (chamaerhodos), *Hudsonia tomentosa* (sand heather), *Juniperus horizontalis* (creeping juniper), *Helianthus couplandii* (Coupland's sunflower), *Lysimachia juncea* (skeletonweed), *Heterotheca villosa* (golden aster), and others, including the rare *Cyperus schweinitzii* (sand nut-rush), *Schinneroseris rostrata* (annual skeletonweed), and perhaps *Carex ?houghtoniana* (Houghton's sedge) and *Chenopodium ?leptophyllum* (narrow-leaved goosefoot) (? indicates problematic determination).

The upland forests often have young tree canopies of *Populus tremuloides*, with shrub strata of *Prunus virginiana, Rosa acicularis, Ribes oxyacanthoides* (northern gooseberry), *Spiraea alba* (narrow-leaved meadowsweet), *Symphoricarpos occidentalis, Symphoricarpos albus* (snowberry) and *Viburnum edule* (low-bush cranberry), and a herb cover of *Carex pensylvanica* var. *digyna, Oryzopsis asperifolia* (white-grained mountain rice grass), *Oryzopsis pungens* (northern rice grass), *Schizachne purpurascens* (purple oat grass), *Aster ciliolatus* (Lindley's aster), *Galium boreale* (northern bedstraw), *Thalictrum venulosum* (veiny meadow rue), *Maianthemum canadense* (wild lily-of-the-valley) and others, including the rare *Hedyotis longifolia* (long-leaved bluets).

The lowland subhygric forests often are well-developed and more mature with a closed tree canopy of *Populus balsamifera* (balsam poplar), with some *Populus tremuloides*, a tall shrub stratum of *Salix bebbiana* (beaked willow), *Viburnum opulus* subsp. *trilobum* (high-bush cranberry), and *Prunus virginiana*, a low shrub stratum of *Rosa acicularis, Symphoricarpos occidentalis, Cornus stolonifera* (red-osier dogwood), *Corylus cornuta* (beaked hazelnut), *Ribes americanum* (wild black current) and others, and a herb cover of *Aralia nudicaulis* (wild sarsaparilla), *Rubus pubescens* (dewberry), *Viola canadensis* var. *rugulosa* (western Canada violet), *Smilacina stellata, Maianthemum canadense, Linnaea borealis* var. *americana* (twinflower), *Pyrola asarifolia* (common pink shinleaf) and others, including the provincially rare *Botrychium multifidum* var. *intermedium* (leather grape-fern).

Thicket swamps support a subhygric to hygric tall shrub cover of *Betula occidentalis* (water birch), *Salix pseudomonticola* (false mountain willow), *Salix maccalliana* (velvet-fruited willow), *Salix petiolaris* (basket willow) and others, with an understory of several of the low shrub and wetland herb species, such as *Ribes americanum, Cornus stolonifera, Rosa acicularis, Rubus pubescens, Fragaria virginiana* var. *glauca* (wild strawberry), *Carex utriculata* (small bottle sedge), *Viola nephrophylla* (bog violet), *Glyceria striata* var. *stricta* (fowl meadow grass), *Cicuta maculata* var. *angustifolia* (water-hemlock) and others, including the provincially rare *Lycopus americanus* (American water-horehound) and *Carex crawei* (Crawe's sedge).

Marshes and marsh fringes include *Carex aquatilis* (water sedge), *Carex utriculata, Calamagrostis canadensis* (bluejoint), *Eleocharis palustris* (creeping spike-rush), *Juncus balticus* var. *littoralis* (wire rush), *Eleocharis acicularis* (needle spike-rush), *Glyceria grandis* (common tall manna grass), *Potentilla anserina* (silverweed), *Sonchus uliginosus* (smooth perennial sow-thistle) and others, including the provincially rare *Lycopus americanus* and perhaps *Veronica catenata* (water speedwell) and *Eleocharis ?elliptica* (slender spike-rush).

The hygric to subhydric patterned and seepage fens support a flora of over 80 wetland species, many of which are distinctive and represent a northerly element in the flora, such as *Calamagrostis inexpansa* (northern reed grass), *Triglochin maritima* (seaside arrow-grass), *Carex canescens* (sedge), *Carex diandra* (two-stamened sedge), *Carex gynocrates* (northern bog sedge), *Carex lanuginosa* (wooly sedge), *Carex leptalea* (bristle-stalked sedge), *Carex tenuiflora* (thin-flowered sedge), *Carex prairea* (prairie sedge), *Eriophorum polystachion* (tall cotton-grass), *Eriophorum gracile* (slender cotton-grass), *Smilacina trifolia* (three-flowered Solomon's-seal), *Tofieldia glutinosa* (sticky false asphodel), *Platanthera obtusata* (blunt-leaved bog orchid), *Minuartia dawsoniensis*

(Dawson sandwort), *Parnassia palustris* var. *neogaea* (mealy primrose), *Menyanthes trifoliata* (buck-bean), *Pedicularis groenlandica* (elephant's-head), *Galium labradoricum* (Labrador bedstraw) and others, including the provincially rare *Drosera linearis* (slender-leaved sundew).

The backshore vegetation around the David Lake basin supports many alkaline species in their shrubby marsh vegetation, notably *Carex capillaris* var. *chlorostachys* (hair-like sedge), *Carex viridula* (green sedge), *Carex scirpoidea* (rush-like sedge), *Eleocharis quinqueflora* (few-flowered spike-rush), *Juncus longistylis* (long-styled rush), *Senecio pauperculus* (balsam groundsel), *Parnassia palustris, Primula incana* (mealy primrose), *Dodecatheon pulchellum* (saline shooting-star), *Gentiana amarella* subsp. *acuta* (felwort) and others, including the provincially rare *Gentiana fremontii* (marsh gentian), *Carex crawei* and *Lycopus americanus.* The near- to offshore vegetation in the David Lake basin includes *Hordeum jubatum* (foxtail barley), *Carex utriculata, Scirpus validus* (common great rush), *Calamagrostis stricta* (narrow reed grass), *Deschampsia cespitosa* (tufted hair grass), *Puccinellia nuttalliana* (Nuttall's salt-meadow grass), *Glaux maritima* (sea milkwort), *Ranunculus cymbalaria* (seaside buttercup), *Potentilla anserina, Aster brachyactis* (rayless aster), *Scirpus pungens* (three-square rush), *Aster ericoides* (tufted white prairie aster) and others, including the provincially rare *Muhlenbergia asperifolia* (scratch grass), *Aster pauciflorus* (few-flowered aster) and *Carex parryana* (Parry's sedge). The open waters of the lake and ponds, now much reduced during the 2002 survey due to the prolonged drought, support *Potamogeton pectinatus* (sago pondweed), *Ranunculus circinatus* (firm white water crowfoot), *Hippuris vulgaris* (common mare's-tail) and others, including reports of the provincially rare *Najas flexilis* (slender naiad), *Ruppia cirrhosa* (widgeon-grass) and *Elodea ?bifoliata* (two-leaved waterweed).

The vascular plant flora has been documented for twenty-five years through various surveys in the Ecological Reserve and its immediate vicinity by Bradley & Bradley (1977), Fehr (1984), Cottonwood Consultants, Ltd. (1986), Wallis (1990), the Reserve's management plan (Anon 1998) and Miejer (2001), and through various collection and other recording sources, Johnson (1992), Cotterill (2000), ANHIC (2002), and now by the author of this report (Macdonald 2002). In all, the 506 taxa have been reported from the Reserve and its immediate vicinity through the above survey. These included 415 species records that have been confirmed as occurring within the current boundaries of the Ecological Reserve's, and that appear to have a reliable determination. As well, there are an additional ten records that only may tentatively be accepted due to nomenclatural or taxonomic problems. Within the Reserve, 33 of these species are non-natives, generally of Eurasian origins. However, several of these reports were drawn from surveys of areas that were outside the current boundaries of the Ecological Reserve, particularly westward to the Wallaby Lake and Ribstone Creek areas and eastward to include Sections 12 and 13 of Township 42 (Bradley & Bradley 1977, Fehr 1984, Cottonwood Consultants, Ltd. 1986). There areas supported an additional 31 species records that are confidently determined but have not yet been confirmed as actually occurring within the Reserve's boundaries. There were another 50 confident records for which there was insufficient information to confirm whether or not they occurred within or outside the Reserve's boundaries, 10 of these being non-native species (see Appendices).

The largest families listed within there Reserve are the Asteraceae (62 species), Poaceae (55) and Cyperaceae (53). During the 2002 survey, a total of 61 species that were observed or collected by Macdonald from within the Reserve were added to the Reserve's flora, and an additional five species that were added occurred outside of, but immediately adjacent to, the Reserve' boundaries. Additionally, 58 taxa appear to represent extensions to their ranges as mapped in the *Flora of Alberta* (Moss 1983). For the most part these occurred between 50 to 100 km from their next-nearest locations in the Grassland, Parkland and southern Boreal Natural Regions, but in several cases they were considerable extensions from their Rockies or far northern or western Parkland ranges, as was the case for *Minuartia dawsonensis, Silene menziesii* and *Thalictrum occidentale*.

Of particular note in the vascular plant flora of the Ecological Reserve are 19 rare species that currently are listed by ANHIC (2002) as having a provincial Rank in Alberta of **S1** – *Elodea bifoliata* (two-leaved waterweed); **S1S2** – *Najas flexilis* (slender naiad), *Ruppia*

cirrhosa (widgeon-grass), *Carex parryana* var. *parryana* (Parry's sedge); **S2** – *Botrychium multifidum* var. *intermedium* (leather grape fern), *Muhlenbergia asperifolia* (scratch grass), *Carex crawei* (Crawe's sedge), *Carex ?houghtoniana* (Houghton's sedge), *Cyperus schweinitzii* (sand nut-grass), *Drosera linearis* (slender-leaved sundew), *Lycopus americanus* (American water-horehound), *Veronica catenata* (water speedwell), *Hedyotis longifolia* (long-leaved bluets), *Aster pauciflorus* (few-flowered aster), *Shinneroseris rostrata* (annual skeletonweed); **S2S3** – *Gentiana fremontii* (marsh gentian); **SU** – *Eleocharis ?elliptica* (slender spike-rush), *Chenopodium ?leptophyllum* – narrow-leaved goosefoot); and **S3W** – *Asclepias ovalifolia* (low milkweed). All but one of these provincially rare species previously have been reported in the several biophysical and other inventories of the Ecological Reserve and its immediate vicinity, notably by Bradley & Bradley (1977), Fehr (1984), Cottonwood Consultants, Ltd. (1986), Wallis (1990), Anon (1998), Miejer (2001), Johnson (1992), Cotterill (2000) and ANHIC (2002). The present study includes one species that is new to the flora that is possibly rare, *Chenopodium leptophyllum*. However, there are identification problems with three of the above species: *Chenopodium leptophyllum, Carex houghtoniana* and *Eleocharis elliptica*. As well, there are records for six species that were reported from the area but were not repeated in the management plan (Anon 1998), the ANHIC records for tracked species data base (ANHIC 2002) or the *Rare Vascular Plants of Alberta* (Kershaw *et al.* 2001), and the presence of which require further confirmation: *Elodea bifoliata, Najas flexilis Ruppia cirrhosa, Carex ?houghtoniana, Veronica catenata* and *Eleocharis ?elliptica*

METHOD

Alberta Sustainable Resource Development, Resource Data Branch contracted the author to conduct an inventory of the provincially rare vascular plants that had been reported from within the Ecological Reserve, with a view to confirming their locations, habitats, population sizes and potential habitat threats and management concerns, in order to provide a better understanding of their situation and requirements, to provide effective management for their protection and maintenance, and to provide a data base for documenting their occurrences.

Prior to and concurrent with the on-site survey, the above listed references and authorities were consulted to gain a familiarity with the natural features of the Ecological Reserve, and to form a "search image" for the various species; this was documented in the Preliminary Report (Macdonald June 2002). Previously reported records for provincially rare species were relocated by referring to the ANHIC (2002) data base for rare species, and where possible, to the several reports on the natural features of the Reserve (listed above) and through interviews with authorities familiar with the area (Harry Loonen and Patrick Porter of Alberta Sustainable Resource Development, Public Lands Division, Wainwright, and Cliff Wallis of Cottonwood Consultants, Ltd., Calgary). In many cases, these reports served as a guide to the discovery of new locations for the provincially rare species in the Reserve.

The 2002 on-site investigation rare vascular plant survey of the Wainwright Dunes Ecological Reserve was conducted by the author within the Reserve's boundaries, and occasionally just beyond them, over a 20 day period in the 2002 growing season in early summer (13 – 16 June), mid-summer (10 – 12, 14 – 21 July) and late summer (15 – 19 August). The survey of the rare vascular plants followed the general guidelines recommended by the Alberta Native Plant Council (Lancaster 2000). During this phase of the project the author conducted a survey of the apparent potential habitat situations for the various species as was possible in the time frame allowed within the study area. Due to their potential for supporting rare vascular plant species, particular attention was given to those habitats associated with the sand dune ridge blowout, seepage slope, patterned fen, lake backshore to offshore, and other wetlands. All species locations were accessed on foot to minimize damage to the sensitive terrain and vegetation, and allowed a more thorough survey along the routes between them. Rare species locations that were discovered were temporarily demarcated on the ground with flags so that the number of individuals could be accurately counted or estimated, and their extent measured and mapped, and individuals collected for verification, but only where the population would not be compromised. The results of the investigations were recorded on-site with the author's open file format, copies of which submitted to Alberta Sustainable Resource Development, Resource Data Branch office in Edmonton, and are retained on file at the Alberta Natural Heritage Information Centre, Alberta Community Development, Parks and Protected Areas Division offices in Edmonton. This information included all the data requirements of Alberta Environment's Site Description Form and ANHIC's Rare Native Plant Report Form. The following critical items were recorded: 1) rare species name; 2) location using a GPS unit (Eagle Explorer 1996) to determine latitude and longitude to degree and minute in thousandths and occasionally the 1927 datum Universal Transverse Mercator grid coordinates (UTM27) as well, and where accuracy was ensured, an aerial photograph was pierced and labelled at the exact or nearest accurate point; 3) site characteristics, including terrain type, substrate, moisture regime, aspect and slope; 4) associated community pattern, noting for each of the species the tree, tall shrub, low shrub and herb strata they occurred in, and their cover values in closure categories of >95%, 75 - 95%, 50 - 75%, 20 - 50%, 5 - 20%, 1 - 5% and <1%; 5) extent and number of individual plants by direct count or estimation as defined by the growth characteristics that appeared to be appropriate for enumerating the species, such as with discrete individuals, or leaf and inflorescence clusters along a rhizome chain; 6) phenology and growth condition of the rare plant species indicating stage of development, flowering or fruiting success; 7) present and potential threats to the habitat and the immediate vicinity; 8) notes on potential management concerns for the species; 9) notes on field identification characteristics that might aid future surveyors in locating the species; 10) map using planar view or oblique pictorial viewpoint indicating the species' extent in the area and the position of the pink surveyor's flagging tape that acts as a permanent reference to mark the location; 11) photograph to illustrate the plant growth, habitat detail and population extent; and 12) collection number of the rare and other associated species for future herbarium label preparation.

Following the on-site survey, the collected specimens were prepared by drying, then determined or confirmed by the author, inspected and confirmed by Bonnie M. Smith of the University of Calgary Herbarium, and sent to ANHIC in Edmonton for further confirmation by Patsy Cotterill at Alberta Community Development, Parks and Protected Areas. They were deposited for future reference in the herbaria of the University of Alberta (ALTA) and Alberta Community Development, Parks and Protected Areas (PP), both in Edmonton and of the University of Calgary (UAC) in Calgary. The on-site notes were clarified and corrected where necessary, and critical habitat information pertinent to the Ecological Land Survey Description forms of Alberta Sustainable Resource Development and the Rare Native Plant Report Information form of ANHIC were prepared, and the collected species data were summarized in the formatted presentation as species location reports for each of the rare species (see below).

SURVEY RESULTS

The following brief summaries of the species location reports for each of the rare vascular plants species that previously have been reported within the Ecological Reserve or recently have been discovered as a result of the 2002 survey (see map). Their content includes the scientific and common names and provincial and global Ranks for the species in Alberta (Vujnovic & Gould. 2002). A summary of the previously reported species location records and those that were resurveyed and newly discovered during the 2002 survey, comments on the species in the Reserve, apparent threats to the habitats and species locations, and management concerns for addressing the evaluation, monitoring and protection of the species within the Reserve. Further details for each species are provided in the appendices to this report.

Botrychium multifidum var. *intermedium* (leather grape fern)—S2 G5T4?

previous records: One species location with 20 plants was reported from an aspen forest by Cotterill in 2000 (ANHIC 2002).

survey results: Cotterill's 2000 location was refound, based on her UTM27, but the vegetation was a poplar forest with a clearing that was quite different from the aspen forest habitat of her report. No plants of this species were recorded in 2002.

comment: A thorough search of the reported location was conducted, but no rare species were recorded. The area also contained other northerly elements of regional interest.

habitat threats: No immediate threats to the species were evident, but there was possible past cutting in the forest.

management: 1) relocate species location

Najas flexilis (slender naiad)—S1S2 G5

previous records: One species location was reported by Fehr (1984) in a "beaver pond", probably at the Great Fen pond. No plant number information was available. The 1983 collection of Fehr is at PMAE (Provincial Museum of Alberta, Edmonton).

survey results:	The species was not recorded in above location in 2002.
comment:	The Great Fen pond and most potential remaining ponds, streams and dugouts were searched, but no plants were recorded.
habitat threat:	Pond drawdown due to drought conditions affected the available standing water for this aquatic species.
management:	1) find and confirm Fahr's specimen 2) relocate species location in moister climatic conditions

***Ruppia cirrhosa* (widgeon-grass)—S1S2 G5**

previous records:	One species location was reported by Fehr (1984) and cited by Cottonwood (1986) and Wallis (1990) from the vicinity of the north shore of David Lake where it occurred as a submergent aquatic in extensive marshes and open water of the saline lake. No plant number information was available.
survey results:	This aquatic species was not recorded in above location or elsewhere in the Reserve in 2002.
comment:	David Lake was dry due to the drought in 2002. The remaining channels, dugouts and water courses were searched, but no plants were recorded.
habitat threat:	Extensive drawdown of the lake level due to drought conditions reduced the amount of standing water for this aquatic.
management:	1) confirm specimen 2) relocate species locations in moister climate conditions

***Elodea bifoliata* (two-leaved waterweed)—S1 G4G5**

previous records:	One species location was reported by Fehr (1984) as "*Elodea canadensis*" from "thicket pools, beaver pond". However, no location and no plant number information was available.
survey results:	This rare aquatic species was not recorded in above location or elsewhere in the Reserve in 2002.
comment:	This is a tentative occurrence in the Reserve. It possibly occurred in the Great Fen pond area. The Great Fen pond and most potential

habitat in remaining ponds, streams and dugouts were searched for the species, but no individual plants were recorded.

habitat threat: The drawdown of the pond water level due to the drought conditions reduces the available standing water habitat for this aquatic species.

management: 1) confirm specimen 2) relocate species location in moister climatic conditions

Muhlenbergia asperifolia (scratch grass)—S2 G5

previous records: One species location was reported by Wallis (1990) from theDavid Lake basin in "sandy lake upper shore". No plant number information was available.

survey results: During the 2002 survey there were 17 species locations discovered on the David Lake basin drawdown alkaline sandy offshore and nearshore meadows, of which 13 species locations were recorded within the Reserve boundaries, and four outside. 72 780 plants were counted and estimated within the Reserve, and an estimated three million plants extended outside boundaries along a 700 m extent of David Lake's eastern shore.

comment: The species is successional on exposed alkaline sands of David Lake basin. It probably has additional species locations in the basin. It occurred in association with two provincially rare vascular plants, *Aster pauciflorus* (S2 G4) and *Carex parryana* (S1S2 G4T5).

habitat threat: Raising the water levels of the David Lake basin would drown the present species locations and reduce their extent to along the basin's shore.

management: 1) monitor known species locations 2) rediscover further species locations 3) monitor cattle grazing

***Carex crawei* (Crawe's sedge)—S2 G5**

previous records: Four species locations were reported by Cottonwood Consulting, Ltd. (1986), and through collection records of Johnson & Cotterill in 1992 and Cotterill & Meijer in 2001 (ANHIC 2002) from at least four locations in the Great Fen and the David Lake northern backshore occurring in patterned fen and seepage slope grove habitats. The records of Cotterill and Meijer in 2001 reported "hundreds" from the David Lake northern backshore.

survey results: One species location was discovered outside the Reserve's boundaries on the David Lake northern backshore in a shrubby graminoid marsh, with 13 plants counted in very small area.

comment: The larger species location of the 2001 report was not relocated, although the area was searched, although it possibly was overlooked. There is high potential for plants to occur elsewhere around the David Lake basin. The backshore shrubby graminoid marsh habitat of the recently discovered population apparently was heavily cut and cleared in 1990s from forest and tall thicket habitat (H. Maull 2002). This species is associated with the provincially rare *Gentiana fremontii* (S2S3 G4).

habitat threat: The lowered water table in the habitat caused by the drought potentially has introduced retrogressive succession. The recent disturbance due to land clearing may have changed the associated community, but also may have improved the site conditions for this rare species.

management: 1) relocate previous species locations 2) monitor recent species locations 3) assess land clearance impact upon plant location

***Carex houghtoniana* (Houghton's sedge)—S2 G5**

previous records: One species location was reported by Cottonwood (1986) from the Reserve's northwestern portion in a lightly grazed active blowout. No plant number information was available.

survey results: The species was not recorded in the apparent vicinity of the above location in 2002.

comment: Wallis (2002) was confident of this record, but it was not included by ANHIC in their rare plant species data base (ANHIC 2002). The similar *Carex lanuginosa* was discovered in an active blowout habitat in the same general area. The species location supported two rare species, *Cyperus schweinitzii* (S2 G5) and *Shinneroseris rostrata* (S2 G5?).

habitat threat: Sand erosion from the active blowout may expose the species roots.

management: 1) find and confirm specimen 2) relocate species location

***Carex parryana* var. *parryana* (Parry's sedge)—S1S2 G4T4**

previous records: Three species locations were reported by Fehr (1984), Cottonwood Consultants, Ltd. (1986), Wallis (1990) and Meijer (2001) from the David Lake basin north offshore in wet saline meadows. Meijer reported observing 18 plants in the Reserve in 2001.

survey results: Ten species locations with 12 621 plants were discovered within the Reserve, and four species locations with 11 025 plants from outside the Reserve, totalling 23 646 plants. The species habitats are occur in the David Lake basin near- to offshore drawdown zones as alkaline meadows and hummocky grasslands.

comment: There probably is a larger number of plants of this species along the southeastern and western portions of the David Lake basin. It occurred in association with the provincially rare *Muhlenbergia asperifolia* (S2 G5) and *Aster pauciflorus* (S2 G4).

habitat threat: The drought conditions are greatly drying the potential habitats in the inland sites. Reestablishment of the water levels of David Lake would drown plants.

management: 1) monitor known species locations 2) locate additional species locations elsewhere around David Lake's shore and in the peninsula meadows

Cyperus schweinitzii (sand nut-grass)— 2 G5

previous records: Ten species locations were reported by Fehr (1984), Cottonwood Consulting, Ltd. (1986) and Johnson (2001) from seven locations in the Reserve. All occurred in active to semiactive sandy blowout habitats. No plant number information is available on these species locations.

survey results: There were 15 species locations discovered in the Reserve from two known general species locations, with a total population of 9 123 plants. The habitats for these plants were semiactive to active blowout slopes of the dune ridges.

comment: The populations were not affected by the drought conditions. The species was associated with the provincially rare *Shinneroseris rostrata* (S2 G5?), Chenopodium ?*leptophyllum* (SU G5) and possibly *Carex ?houghtoniana* (S2 G5)

habitat threat: Wind erosion of sand in the blowout slopes may expose rhizomes of the plants, and excessive deposition may bury them.

management: 1) monitor species locations 2) monitor drought impacts on this dry site species

Eleocharis ?elliptica (slender spike-rush)—SU G5T5

previous records: One species location was reported by Fehr (1984), as *Eleocharis compressa*, to the west of Reserve's boundaries in a shrubby fen habitat, forming 0.5% in his community sample herb cover.

survey results: One possible species location was discovered at the Great Fen pond, on a beaver dam, with at least six plants.

comment: Macdonald collection requires confirmation. There are possible nomenclature problems where it was originally determined as *Eleocharis compressa*, but also may be this species if the potentially rare *Eleocharis mamillata*. It is associated with provincially rare plant *Lycopus americanus* (S2 G5)

habitat threat: The drought conditions have caused considerable drawdown of the pond water level, exposing considerable bare pond margin habitat. This may cause aggressive succession of other plants into its habitat. There may be minor trampling by wildlife and cattle.

management: 1) confirm specimen 2) refind and monitor species location

Chenopodium ?leptophyllum (narrow-leaved goosefoot)—SU G5

previous records: This rare species was unreported in the Reserve prior to 2002.

survey results: There were seven species locations with a total of 164 plants discovered in the southwestern portion of the Reserve on sandy grassland meadows and active sandy blowouts.

comment: The determination of the specimens of this species is tentative. It also may be the rare *Chenopodium dissectum*. It also was associated with the provincially rare *Shinneroseris rostrata* (S2 G5?) and *Cyperus schweinitzii* (S2 G5).

habitat threat: Wind erosion of sand in the blowout habitats may expose or bury existing species locations.

management: 1) confirm specimens 2) find additional species locations 3) monitor known species locations

Drosera linearis (slender-leaved sundew)—S2 G4

previous records: Five species locations were reported by Fehr (1984), Cottonwood Consulting, Ltd. (1986) and Wallis (1990) from the Great Fen in shrubby graminoid fen and possibly in pond backshore tall thickets. The plant number information was limited to the comments "uncommon" or "occasional".

survey results: This species not rediscovered at above location during the 2002 survey.

comment: While the Great Fen supported ample suitable habitat in spite of drought conditions, no plants of this species were refound. All potential habitats and locations were thoroughly examined during several (portions of the 2002 growing season.

habitat threat: The continued drought conditions on the surface and ground water levels affected the condition of the fen habitats for the species.

management: 1) refind species locations in Great Fen area 2) monitor species locations

Gentiana fremontii (marsh gentian)—S2S3 G4

previous records: Four species locations were reported by Fehr (1984), Cottonwood Consulting, Ltd. (1986) and Wallis (1990) from the northern offshore and peninsula of David Lake. The species occupied hummocky moist meadow and thicket fen, seepage fen and saline spring habitats. No information on the number of plants for this rare species was available.

survey results: Two species locations were discovered within the Reserve in the northern and southwestern backshore thickets of David Lake with one or two plants. As well, two species locations were recorded to the east of the Reserve boundary in the backshore shrubby marsh habitat, with a counted plant number of 326 individual plants and potentially a number of 1 000 plants, based on the density within the narrow strip that was surveyed in the potential habitat.

comment: The habitat outside the Reserve boundaries on the north side of David Lake was disturbed in the past decade by severe cutting to improve grazing capability (Maull 2002). Fehr's specimen collection was discovered at the Alberta Parks and Protected Areas herbarium. The species is associated with the provincially rare species *Carex crawei* (S2 G5).

habitat threat: The prolonged drought conditions have affected the groundwater quality and moisture regime of the habitat. As well, the cutting for site improvement opened the community cover and may have affected the plant numbers.

management: 1) monitor plant locations 2) find additional plant locations 3) resurvey hummock terrain and seepage fen sites

Asclepias ovalifolia (low milkweed)—S3W G5?

previous records: Three species locations were reported by Bradley & Bradley (1977), Fehr (1984) and Cottonwood Consultants, Ltd. (1986) from sand hill grassland to the west of the Great Fen and elsewhere, but with no plant number information available.

survey results: There were 16 species locations discovered to the west of David Lake, west and north of the Great Fen, and in the Reserve's northern corner in rolling sand plain grassland, with 1 317 plants counted within the Reserve.

comment: During the drought in 2002, the population produced flowering inflorescences; however the flowers were dried and had abscissed by mid-summer, and fruit development was arrested. This species is on the provincial Watch list (ANHIC 2002).

habitat threat: The drought conditions had an impact on the plant development. There may have been an impact by fire in the past, and there is a potential by wildlife and cattle trampling and grazing.

management: 1) monitor known species locations 2) discover new species locations in sandland situations

***Lycopus americanus* (American water-horehound)—S2 G5**

previous records: Five species locations were reported by Bradley & Bradley (1977), Fehr (1984) and Cottonwood Consulting, Ltd. (1986) from just northwest of David Lake in wetlands of the lake's shoreline in a sandland depression, and in a seepage fen. No information on the numbers of plants was given, other than a note of "uncommon - here sparse".

survey results: There were 16 species locations discovered within the Reserve around the Great Fen pond, to the northeast of the Great Fen, on the northern David Lake backshore, and north of David Lake. These plant locations occurred along a drawdown beaver pond dam and along its shoreline marsh fringes, and also in lake backshore, seepage fen and lowland basin situations in tall thicket swamps. A total of 887 plants was counted within the Reserve, and 15 were counted at one site just outside its eastern boundary.

comment: There is potential for a much larger population along the David Lake backshore in tall thicket habitats. It was associated with the provincially rare plant *Gentiana fremontii* (S2S3 G4).

habitat threat: The drawdown conditions of David Lake and the pond, stream and seepage water levels due to drought conditions may affect the plant habitats and numbers.

management: 1) monitor populations 2) refind previously reported species locations 3) determine impact of drought on beaver populations

***Veronica catenata* (water speedwell)—S2S3 G5**

previous records: One species location was reported by Fehr (1984) from a "wet area near beaver lodge". This possibly was located at the Great Fen pond. No plant number information was available.

survey results: This species was not refound at the above location or elsewhere in the 2002 survey.

comment: The potential shoreline and wetland habitats were thoroughly searched, but no plants were found.

habitat threat: The pond shoreline has experienced considerable drawdown due to the prolonged drought conditions. This may create suitable potential habitat conditions for this species, but also may invite competition from weed invasion.

management: 1) find and confirm specimen 2) refind and monitor plant locations

***Hedyotis longifolia* (long-leaved bluets)—S2 G4G5**

previous records: One species location was reported by Cottonwood Consultants, Ltd. (1986) 1 km west of the Great Fen in an aspen grove. No plant number information was available.

survey results: This species was not refound at above location during the 2002 survey.

comment: The aspen grove area indicated above was thoroughly searched, but the species was not found.

habitat threat: There was past fire impact that modified the growth of the aspen community cover. There is at present a low trampling, grazing and fire potential.

management: 1) refind and confirm specimen 2) relocate and monitor plant location and numbers

Aster pauciflorus (few-flowered aster)—S2 G4

previous records: Two species locations were reported by Wallis (1990) and Miejer (2001) from the northern side of the David Lake basin to the east of the peninsula in "wet saline and subsaline lakeshores and edges of hummock meadows". There was limited plant number information that indicated a count of 18 plants in 2001.

survey results: Nine species locations were discovered within the Reserve on the northern side of the David Lake basin to the northeast, east and south of the peninsula. Within the Reserve a total of 551 plants were counted, and outside the Reserve on the eastern side of the lake there was an estimated over 6 000 plants. In both cases they occurred in the drawdown lake basin's near- and farshore alkaline meadows and barren habitats.

comment: There is potential for a much larger population outside the Reserve along David Lake's southeastern portion. It was associated with the provincially rare plants *Muhlenbergia asperifolia* (S2 G5) and *Carex parryana* (S1S2 G4T4)

habitat threat: A rise in the water level of David Lake would drown the plants of this species.

management: 1) monitor known species locations 2) locate additional species locations elsewhere around David Lake's shore

Shinneroseris rostrata (annual skeletonweed)—S2 G5?

previous records: Three species locations were reported by Cottonwood Consultants, Ltd. (1986) and Johnson (1992) to the north of David Lake in sand dune blowout habitats. No information on plant numbers was available.

survey results: There were 18 species locations discovered well to the west, northwest and north of David Lake in the sand ridge semiactive blowout habitats. A total of 257 plants was counted within the Reserve.

comment: There probably are additional species locations in those blowout habitats with *Cyperus schweinitzii* that were surveyed too early in growing season for this species to have been evident.

habitat threat: Wind erosion of blowout sand was observed to locally be advancing over this plant species' locations.

management: 1) monitor known populations 2) discover additional species locations 3) monitor drought conditions and its impact on seed production and germination success

As well, there are two provincially rare vascular plant species that had been reported from the Reserve by Fehr (1984) and Cottonwood Consultants, Ltd. (1986) and were listed in the compilation flora in the Reserve's management plan (Anon 1998), but which should be withdrawn, *Danthonia californica* Bol. (California oat grass) and *Carex rostrata* J. Stokes (beaked sedge). In both cases, the nomenclature used was based on that appearing in the 1983 edition of *Flora of Alberta*, which has since been revised. Wallis (2002) concurred with this recommendation. In the case of the *Danthonia californica*, the literature now distinguishes the smaller *Danthonia intermedia* from the larger *Danthonia californica*, and only the former has been recorded from the Reserve. In the case of *Carex rostrata*, the literature recognizes two varieties, the rare var. *rostrata* and the more common var. *utriculata* (F. Boott) L. Bailey which now has species status as *Carex utriculata* F. Boott (NatureServe 2003), and only the latter has been recorded from the Reserve.

DISCUSSION

During the 2002 survey of rare vascular plants in the Wainwright Dunes Ecological Reserve, the following 19 species were investigated (the scientific and common names, and provincial conservation Rank in Alberta are given):

Elodea bifoliata (two-leaved waterweed)—S1 G4G5
Najas flexilis (slender naiad)—S1S2 G5
Carex parryana var. *parryana* (Parry's sedge)—S1S2 G4T4
Aster pauciflorus (few-flowered aster)—S2 G4
Botrychium multifidum (leather grape fern)—S2 G5T4?
Ruppia cirrhosa (widgeon-grass)—S2 G5
Muhlenbergia asperifolia (scratch grass)—S2 G5
Carex crawei (Crawe's sedge)—S2 G5
Carex ?houghtoniana (Houghton's sedge)—S2 G5
Cyperus schweinitzii (sand nut-grass)—S2 G5
Drosera linearis (slender-leaved sundew)—S2 G4
Lycopus americanus (American water-horehound)—S2 G5
Veronica catenata (water speedwell)—S2 G5
Hedyotis longifolia (long-leaved bluets)—S2 G4G5
Shinneroseris rostrata (annual skeletonweed)—S2 G5?
Gentiana fremontii (marsh gentian)—S2S3 G4
Eleocharis ?elliptica (slender spike-rush)—SU G5T5
Chenopodium ?leptophyllum (narrow-leaved goosefoot)—SU G5
Asclepias ovalifolia (low milkweed)—S3W G5?

Ten of these species were relocated and additional locations were discovered within the Reserve and its immediate vicinity, as follows (these plants are grouped according to their provincial Rank in Alberta; numbers indicate the number of new species locations and number of plants occurring within the Reserve boundary, and, indicated in brackets (), for those occurring outside the boundary):

S1S2 *Carex parryana* var. *parryana* (Parry's sedge)—10 species locations with 12

	621 plants (4 species locations with 11 025 plants)
S2	*Muhlenbergia asperifolia* (scratch grass)—3 species locations with 72 780 plants (4 species locations with 3 000 000 plants)
S2	*Carex crawei* (Crawe's sedge)—0 species location with 0 plants (1 species locations with 13 plants)
S2	*Cyperus schweinitzii* (sand nut-grass)—15 species locations with 9 123 plants (none)
S2	*Lycopus americanus* (American water-horehound)—16 species locations with 887 plants (1 species location with 15 plants)
S2	*Aster pauciflorus* (few-flowered aster)—9 species locations with 551 plants (1 species location with 6 000 plants)
S2	*Shinneroseris rostrata* (annual skeletonweed)—18 species locations with 257 plants
S2S3	*Gentiana fremontii* (marsh gentian)—2 species locations with 3 plants (4 species locations with 184 (possibly over 1 000) plants)
SU	*Eleocharis* ?elliptica (slender spike-rush)—1 species location with 6 (?) plants (none)
SU	*Chenopodium ?leptophyllum* (narrow-leaved goosefoot)—7 species locations with 164 plants (none)
S3W	*Asclepias ovalifolia* (low milkweed)—16 species locations with 1 317 plants (none)

Six of these species (*Muhlenbergia asperifolia, Aster pauciflorus, Carex parryana* var. *parryana, Gentiana fremontii, Lycopus americanus, Carex crawei*) occurred within the Ecological Reserve as concentrations in the near- to offshore habitats of the David Lake basin near the peninsula's southern tip and along its eastern side, and outside of the Reserve along the basin's southeastern side. Three of these species occurred in association with the sand ridge blowout habitats at several locations within the Reserve (*Cyperus schweinitzii, Shinneroseris rostrata, Chenopodium ?leptophyllum*). Two of these species occurred in association with the wetland habitats of beaver pond dams and shores, and actively flowing springs (*Lycopus americanus, Eleocharis ?elliptica*). One of these species occurred in shrubby grasslands on the rolling sand plains (*Asclepias ovalifolia*).

Eight of the rare vascular plant species that had been reported in previous studies (Fehr 1984, Cottonwood Consultants, Ltd. 1986, Cotterill 2000) could not be relocated within the Reserve, and hence, no new locations or information on the number of plants are available for them, as follows (plants are grouped according to their provincial Rank in Alberta; numbers indicate number of former species locations and populations):

S1	*Elodea bifoliata* (two-leaved waterweed)—1 former species location with unknown number of plant numberss
S1S2	Najas flexilis (slender naiad)—1 former species location with unknown number of plants
S2	*Botrychium multifidum* (leather grape fern)—1 former species location with unknown number of plants
S2	*Ruppia cirrhosa* (widgeon-grass)—3 former species locations with unknown number of plants
S2	*Carex ?houghtoniana* (Houghton's sedge)—1 former species location with unknown number of plants
S2	*Drosera linearis* (slender-leaved sundew)—5 former species locations with unknown number of plants
S2	*Veronica catenata* (water speedwell)—1 former species location with unknown number of plants
S2	*Hedyotis longifolia* (long-leaved bluets)—1 former species location with unknown number of plants

One of these species was reported from the David Lake basin (*Ruppia cirrhosa*), two from a "beaver pond", possibly that to the southeast of the Great Fen (*Elodea bifoliata, Najas flexilis*), one from an aspen grove west of the Great Fen (*Hedyotis longifolia*), one from the Great Fen itself (*Drosera linearis*), one from aspen forest north of David Lake (*Botrychium multifidum* var. *intermedium*), one from a sand ridge blowout in the Reserve's northwestern portion (*Carex ?houghtoniana*), and one which had no reported location (*Veronica catenata*). The considerable drawdown condition of David Lake due to the prolonged drought, rendering it virtually without standing water except for local dugouts, left no habitat for the *Ruppia cirrhosa*, and similarly the drawdown of the Great Fen pond greatly reduced the aquatic habitat for the *Elodea bifoliata* and *Najas flexilis*.

The aspen grove and poplar forest habitats of the *Hedyotis longifolia* and the *Botrychium multifidum* were diligently searched, but no plants found, perhaps due to unsuitable growth conditions for the species caused by the drought conditions in the former case, but possibly due to an incorrectly reported location in the latter case. A similarly diligent search of the patterned fen habitat in the Great Fen for the *Drosera linearis* did not rediscover any plant locations, although ample suitable habitat was available. The *Veronica catenata* had no reported location, but was unsuccessfully searched for in suitable habitats. The sand ridge blowout habitats at the reported general location for the *Carex ?houghtoniana* were searched; however, since only a similar, but common, species (*Carex lanuginosa*) was discovered, the original report requires confirmation (Cottonwood Consultants, Ltd. 1986).

HABITAT THREATS

The habitat threats to the locationsd and habitats of the provincially rare vascular plant species generally fall into the following four categories:

1. Xeric conditions of prolonged drought:
   The drought conditions over the previous three years have resulted in the marked drawdown of David Lake, the Great Fen pond and most of the other water bodies in the Reserve. This has resulted in at least the temporary loss of much significant aquatic habitat, and possibly also the permanent loss of three aquatic species from the Reserve's flora, *Elodea bifoliata, Najas flexilis* and *Ruppia cirrhosa*. However, the persistence of a resilient seed bank or other propagule mechanism in these drained situations may allow the species to reappear in a moister climatic period. Additionally, the dry conditions have contributed to the loss of beaver activity in several of the stream channels and ponds, resulting in the degradation of the dams and a further exacerbation of the drawdown situation. This has affected the known plant numbers of three lowland species, *Lycopus americanus*, and possibly *Eleocharis ?elliptica* and possibly *Veronica catenata*. However, this drawdown situation has extended the shoreline fringe habitat that may provide additional opportunities for the above species to increase their numbers, at least until the water levels are restored. The greatly lowered groundwater levels in lowland sites has stressed the associated swamp and lowland forest, and thicket and marsh communities with their rare species *Botrychium multifidum* var. *intermedium*and *Lycopus americanus*, and notably also the patterned fen communities in the Great Fen with its species location of the provincially rare *Drosera linearis*. The groundwater and surface water flow patterns in the seepage slope sites around David Lake have resulted in a notable drying of the ground surface, possibly initiating a change in retrogressive succession and affecting the plant numbers of *Gentiana fremontii, Carex parryana, Carex crawei* and *Lycopus americanus*. The further dessication of the already dry grassland habitats was observed to interfere with the inflorescence development of at least one species, *Asclepias obtusifolia*. However, it was

apparent that those species that normally were associated with very dry habitats, *Cyhperus schweinitzii* and *Shinneroseris rostrata*, did not display major reduction in their anticipated normal growth due to the prolonged drought.

2. Cessation of drought causing flooding of sites:

The considerable drawdown in David Lake caused by the prolonged drought has resulted in an extensive plain of exposed alkaline sand that has provided ample habitat conditions for several rare plants to succeed over and greatly expand their populations, notably *Muhlenbergia asperifolia*, *Aster pauciflorus* and *Carex parryana*. However, when the drought ends and the water level is restored in the lake, these populations will be inundated and will be unable to grow and produce inflorescences. Nevertheless, these species all produce perennial rhizomes that may well be adapted to surviving such a situation, and may rebound in later lower water levels. Additionally, in the case of the grass *Muhlenbergia asperifolia*, the inflorescences which produce a profuse number of seeds, become detached from the plants, and blow across the lake plain to be deposited in the backshore sites around the periphery of the lake; these may well provide a seed bank for the growth of plants around the lakeshore in years of higher water levels.

3. Grazing and trampling:

Grazing by the reduced size of the cattle herds appeared to be localized around the David Lake basin and its immediate vicinity. The grazing pattern did not appear to directly affect any of the populations of rare plants, since they generally were not vigorous or palatable enough to be a targeted forage species. As well, the grazing patterns of the cattle tended to remove about 50 to 75% of the vegetation cover, but only within relatively narrow swaths approximately one or two metres wide through the associated communities. This often left well over 80% of the potential habitat and associated plant community ungrazed. Several cattle and game trails were recorded as passing through, or adjacent to, the general locations for and habitats of several of the provincially rare species, such as *Lycopus americanus*, *Asclepias obtusifolia*, *Carex crawei* and *Gentiana fremontii*, with some very incidental grazing along either side of the trails.

4. ATV disturbance:

   Only one instance of ATV ("quad") use within the Reserve was recorded, where a year-old track crossed one of the sand dune ridges, initiating only a local exacerbation of blowout erosion and deposition. However, this track did not directly impinge upon populations of the nearby dune blowout with its provincially rare species, *Cyperus schweinitzii* or *Shinneroseris rostrata*.

MANAGEMENT CONSIDERATIONS

The following management concerns should be addressed in future activities leading toward the protection of the rare vascular plant species in the Reserve:

1. Monitoring known rare plant populations:

   The prolonged regional drought conditions undoubtedly impose stresses upon the habitats and growth behaviour of the provincially rare plant species in the Reserve. This has resulted in changes to the number of individual plants that may be evident from year to year. For example, of the notable report of "hundreds" of *Carex crawei* plants occurring in the David Lake backshore tall thickets (Cotterill & Majeir 2001), not one plant could be found in 2002. On the other hand, the populations of *Cyperus schweinitzii* appeared to be thriving at their locations, which may be understandable since they are, after all, species adapted to xeric sand habitat species. *Shinneroseris rostrata* is an annual that is fully dependent upon the production and germination of its seed bank for survival from year to year, and while the drought conditions may be anticipated to act against this species, the plant numbers that were recorded, indicated that, in spite of the little rain over the previous summer and winter, they must have been able to readily germinate, or at least take advantage of snow banks along the blowout slope crests.

2 Relocating previously reported rare plant populations:

   Several of the species locations of provincially rare vascular plants could not be relocated during the 2002 survey, either because the drought conditions caused them to not appear in their assumed habitats or because the original reports had insufficient detail for relocating them. A further survey project, perhaps during a wetter year, should attempt to relocate several of the species, such as *Drosera linearis* from the Great Fen, *Gentiana fremontii* from the hummocky grasslands of the David Lake peninsula, *Carex parryana* from the grassland depressions at the base of the peninsula, *Carex crawei* from the northern backshore of David Lake, *Hedyotis longifolia* from the aspen grove west of David Lake, and *Botrychium* *multifidum* from the forests north of David Lake.

3. Relocating and confirming rare vascular plant determinations:
Several of the rare plant occurrences in the Ecological Reserve could not be relocated. Since the original claims probably are based on the determinations of voucher collections, these collections should be sought and confirmed to ensure that they are correctly determined, and if so, the collectors should be contacted to gather further information about their locations if such information can be retrieved after the ensuing two decades. This would be applicable for the following species which could not be relocated or for which the record may require the substantiation or redetermination: *Elodea bifoliata, Najas flexilis, Botrychium multifidum, Ruppia cirrhosa, Carex ?houghtoniana* and *Veronica catenata.*

4. Discouraging ATV use and trampling within the sensitive habitats:
What probably was an unauthorized ATV use in sensitive habitats within the Reserve boundaries was noted only once during the 2002 survey. Nevertheless, there is modest vulnerability to such incursions from the various unmonitored access points around the entire area. Currently, the local ranchers stewarding the Reserve do keep watch for such incursions, and restrict their own use to the periphery of the Reserve and to the interior access roads. With a combination of the concentrations of several provincially rare plants in the blowouts, such as *Shinneroseris rostrata* and *Cyperus schweinitzii*, and the lure of illicit sand dune recreational opportunities afforded by the same blowouts, any illicit vehicular use potentially would result in great and lasting damage to the species locations. Any such use should be monitored and an enforcement and awareness program should be considered if the problem warrants it.

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APPENDIX 1

Botrychium multifidum (S.G. Gmelin) Rupr.

var. intermedium (D.C. Eat.) Farw.

— leather grape fern—OPHIOGLOSSACEAE

This low woodland and field fern has a provincial Rank of **S2** in Alberta and a global rank of **G5T4?** (Vujnovic & Gould 2002, ANHIC 2002). NatureServe (2003) indicated that the authorities for this species are (Gmel.) Trev., and that its other common name is "leathery grape fern". This is one of the more readily recognizable grape ferns in the province. Like the one other large-leaved grape fern that occurs in the province, *Botrychium virginianum* (Virginia grape fern), its sterile blades are relatively large (10 to 25 cm wide, 15 to 35 cm long) and are divided two to three times; however, it differs in that its petiole attachment is near the base of the stalk, the blades are leathery, and it persists through the winter (Moss 1983, Scoggan 1978). It occurs in Alberta as the var. *intermedium* (D.C. Eat.) Farw. (Moss 1983), but the nomenclatural treatment of Wagner & Wagner (1993) in the *Flora of North America* did not recognize this variety.

This species extends across central North America in the boreal and northern temperate zones between Alaska and Newfoundland, and south to California to West Virginia (Wagner & Wagner 1993). It is rare in three provinces, including Alberta, Prince Edward Island and Newfoundland (as well as Labrador), and in ten states (NatureServe 2003). Within Alberta it occurs at 34 known locations, extending between Grande Prairie and east southeast to just east of Edmonton, including an isolated location north of Lake Athabasca (ANHIC 2003, Kershaw *et al.* 2001). The location from the Wainwright Dunes Ecological Reserve was not mapped in the *Rare Vascular Plants of Alberta* (Kershaw *et al.* 2001) or listed in Fehr 1984, but the Element Occurrence Data Base of ANHIC (2003) listed one species location north of David Lake, discovered by Patsy Cotterill and others in July 2000. The apparently exact UTM27 grid location within the Ecological Reserve was relocated during the present survey; however, no plants were rediscovered there or in its general vicinity. Further, the anticipated habitat was not an aspen forest as indicated in Cotterill's specimen label, but rather was a balsam poplar forest with an opening, both of which supported a rich complement of northerly species in the gently undulating mesic sand plain that was somewhat removed from the base of the low bluff slope well north of the present-day David Lake shore. Nevertheless, both the closed forest and opening were surveyed to ascertain their Ecological Land Site characteristics.

Patsy Cotterill (2000) reported that she had recorded 20 plants in the area. In this species, the leaves should persist throughout the year with new leaves developing by early to mid-summer, and the fruiting heads should have developed by mid-summer. However, no plants at all were observed during the 2002 survey, and Cotterill (2003 personal communication) confirmed that the surveyed habitat did not conform to her recollection of her species location.

The habitat that was surveyed during 2002 was a mesic, gently rolling sand plain with a balsam poplar forest and an adjacent shrubby clearing, both of which supported a complement of northerly herb species. The forest had a semiclosed to closed tree cover of *Populus balsamifera*, a semiclosed to semiopen tall shrub cover of *Salix bebbiana, Prunus virginiana, Corylus cornuta*, and *Amelanchier alnifolia* (saskatoon), and low shrub cover of *Cornus stolonifera* and *Symphoricarpos occidentalis*, and a semiopen to semiclosed herb cover of *Aralia nudicaulis, Rubus pubescens, Oryzopsis asperifolia, Viola canadensis, Lysimachia ciliata* (fringed loosestrife), *Thalictrum ?occidentale*, and other rich lowland forest species. The clearing supported a semiclosed to locally open tall shrub cover of *Prunus virginiana, Amelanchier alnifolia* and *Corylus cornuta*, semiclosed low shrub cover of *Rosa acicularis, Symphoricarpos occidentalis* and *Rubus idaeus*, and a semiclosed herb cover of *Schizachne purpurascens, Oryzopsis asperifolia, Galium boreale* and others.

Habitat threats to the species could not be determined at this time; however, none were apparent at the location that was surveyed in 2002. The past cutting that formed the clearing may have imposed some impact on the site conditions for the species. No signs of grazing were evident.

Management considerations must first be to relocate the plants, which should be expected still to be standing since they generally tend not to be ephemeral nor intermittent in their yearly growth and are tall enough to be relatively obvious.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Botrychium multifidum* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	not apply
Flood Hazard	no hazard (1)
Soil Drainage	moderately well drained (4)
Perviousness	moderately (2)
Site: Macro	plain (7)
Site: Meso	level (7)
Site: Micro	straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	mesic (5)
Nutrients	?meso (3)
Successional Status: 1	?mature edaphic climax (6)
Successional Status: 2	not apply
Disturbance Factors	none

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	no information (?early to mid-summer)
Phenology: inflorescence	no information (?mid- to late summer)
Phenology: sporulating	no information (?mid- to late summer)
Habitat Threats:	no information
Management Considerations	refind population

APPENDIX 2

Najas flexilis (Willd.) Rostk. & Schmidt.

— slender naiad—_NAJADACEAE_

This submergent and rooted, annual aquatic herb of pond and stream habitats has a provincial Rank of **S1S2** in Alberta, and a global Rank of **G5** (Vujnovic & Gould 2002, ANHIC 2002). It is the only member of its genus in Alberta, and has a rooted erect stem with many alternating branches, although they often are broken, and with narrow linear leaves in what appear to be whorls of four, that actually are subopposite pairs. It has single, very simple, tiny flowers in the axils of the lower of the subopposite leaf pairs, and single pairs of small, elliptic achenes. The bushy appearance of this species, particularly in late season, allows it to resemble some of the small-leaved *Potamogeton* species, and perhaps even the rare *Elodea bifoliata*. However, it differs from the former in having narrow, serrate leaves that have notably and abruptly broader, clasping bases and no stipules, and from the latter in not having simple opposite leaf pairs (Moss 1983, Fassettt 1957, Muenscher 1972, Voss 1967).

This species occurs across most of North America, is rare in Alberta, Saskatchewan and Prince Edward Island, and in two states, and is may have been extirpated from one state (NatureServe 2003, Kershaw *et al.* 2001). In Alberta it has been recorded from seven locations the Parkland and adjacent southwestern Boreal Natural Regions (ANHIC 2003). The Wainwright Dunes Ecological Reserve appears to be the only known location in the eastern portion of the Parkland Natural Region, and it was first reported in the Ecological Reserve through a collection of A. Fehr in 1983, but was not listed in his list of the Reserve's flora (Fehr 1984). This collection apparently was taken from the large pond on the southeastern side of the Great Fen (ANHIC 2002), northwest of David Lake. However, the 2002 survey of the reserve did not rediscover any plants in this large pond or in other suitable wetland sites.

There was no information on the number of individuals provided in the collection data for the single known specimen from the reserve.

The wetland habitat of the "beaver pond" that the collection label for this species apparently refers to has experienced considerable drawdown due to the prolonged regional drought conditions between 2000 and 2002. Some standing water still occurred in the central portions of the wetland basin; however, the extent of the exposed barren soils along the drawdown fringe was very great. The survey of the pond area during the 2002 survey discovered several species of *Potamogeton, Potamogeton pectinatus, Potamogeton zosteriformis* (flat-stemmed pondweed) and *Lemna minor* (common duckweed), but little else in the aquatic flora. The species' persistence here may require beaver activity to maintain the dam that keeps the water level high.

The major habitat threat to this species within the reserve is the considerable and long term drawdown situation in the beaver pond basin where it was reported over 20 years ago. The regional drought conditions probably have greatly worsened this situation, and probably also has resulted in the apparent loss of the active beaver population to maintain the dams and ponds.

Management considerations should be to resurvey the beaver pond at the southeastern end of the Great Fen, and the other beaver ponds in the reserve, in hope of rediscovering the species. Such surveys in the mid-summer season should prove more productive if the species still persists. The actual collection location of the known specimen may be in doubt, since, while this may be just a clerical error, the latitude / longitude coordinates on the specimen label indicated a point in the sandland about 2 km due west of David Lake where no pond feature exists. As well, the species was not included in Fehr's otherwise meticulously inclusive general species list for the reserve and its vicinity and was not repeated in the compilation list in the Ecological Reserve's management plan (Anon 1998).

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Najas flexilis* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	not apply
Flood Hazard	not apply
Soil Drainage	very poorly (7)
Perviousness	slowly (3)
Site: Macro	plain (7)
Site: Meso	level (7), depression (6)
Site: Micro	straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	hydric (9)
Nutrients	?permesotrphic (4), ?mesotrophic (3)
Successional Status: 1	pioneer (1)
Successional Status: 2	not apply
Disturbance Factors	draining (8)

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	no information
Phenology: reproductive - inflorescence	no information (?June to July)
Phenology: reproductive - flower	no information (?July)
Phenology: reproductive - fruit	no information (?August)
Habitat Threats	pond water level
Management Considerations	refind and monitoring populations

APPENDIX 3

Ruppia cirrhosa (Petagna) Grande
—widgeon-grass—*RUPPIACEAE*

This aquatic herb of saline and alkaline lakes, ponds and ditches has a provincial Rank of **S1S2** in Alberta, and a global Rank of **G5** (Vujnovic & Gould 2002, ANHIC 2002). Its leaves are 5 to 20 cm long and less than 0.5 mm wide in fan-like groups, with sheathing, scarious-margined stipules that are 5 cm to 20 cm long, with very un-*Potamogeton*-like inflorescences consisting of pairs of tiny flowers with no petals and two stamens borne on a spadix from the upper leaf axils, with fruits developing at the tips of four branches in umbel-like clusters atop distinctly coiled culms. While this species is distinctive in its fertile state, it is difficult to differentiate from the similar *Potamogeton pectinatus* in its vegetative state, and may initially also be mistaken for *Potamogeton filiformis* (thread-leaved pondweed). Voss (1967) presented several useful vegetative characteristics to aid in its recognition and to separate it from the genus *Potamogeton*, as follows: sheath with no free ligule at summit, *i.e.*, the stipule wholly adnate to leaf blade, merely rounded at summit (not with a short ligule-like extension of the free stipule at the summit, *i.e.*, the stipule only partly adnate, as in *Potamogeton*); leaf blade terete (not flattened); fruit stalked in an umbel-like arrangement on a spiraled and elongating limp peduncle (not sessile or subsessile in a spike with a straight stiff peduncle). The genus formerly was treated as one species, *Ruppia maritima* L. (formerly called *Ruppia occidentalis* S. Wats.); however, recent taxonomic treatment has restricted that species name to apply to maritime coastal plants, while the name *Ruppia cirrhosa* (formerly called *Ruppia spirillis* L. *ex* Dumort) to apply to continental western North American plants.

This is a circumpolar species that occurs in the western half of North America from the Arctic southward into Central America. It is rare in Alberta, Manitoba and Northwest Territories, and also in two of the western states, and may have been extirpated from one state (NatureServe 2003, Kershaw *et al.* 2001). In Alberta it has been reported from six known locations in the southwestern corner of the Grassland Natural Region and the vicinity of Edmonton in the Parkland Natural Region (ANHIC 2003). Its only reports from the eastern portion of the Parkland Natural Region were those of Fehr (1984) and

Cottonwood Consultants, Ltd. (1986) who reported it from the David Lake basin at the peninsula, apparently in the then standing waters of the lake. This species was not relocated during the 2002 survey of the Ecological Reserve. The extensive drawdown conditions in the entire David Lake basin have rendered the site no more than a big salty parking lot. The entire chain of dugout channels in the basin created by Ducks Unlimited were examined, but no water at all remained in them, and while the two larger dugouts in the basin held some water, no aquatic plants of any sort were observed there. Additionally, the dugout along the Reserve's eastern boundary north of David Lake, and that to the east of the Reserve boundary on the northeastern backshore of David Lake, were surveyed for populations of this species, but none were found.

No information on the number of individuals was available in the several reports for this species' occurrence in the Ecological Reserve, and no plants were relocated during the present survey. It may be that the species has been thoroughly decimated by the drought conditions, and possibly it is even extirpated from the Reserve's flora.

The habitat for this species was indicated by Fehr (1984) to be "submergent" in the then standing waters of David Lake, and the report of Cottonwood Consultants, Ltd. (1986) indicated it to be in "extensive marshes and open water" of the lake, offshore from the central eastern side of the David Lake peninsula. Both of these surveys were conducted in relatively wet years with David Lake being at a high water level. However, the present survey was conducted in a period of extreme drought, and no standing water at all was recorded except in the larger dugouts which had very dark waters from cattle excrement leachate. The relatively cleaner waters of the dugout located along the Reserve's eastern boundary to the northeast of the lake's backshore, and of the several ponds in the interior of the Reserve, did not have this species, although several species of *Potamogeton* were noted, including the similar *Potamogeton pectinatus*, and particular care was taken during the 2002 survey in their determination to ensure that these were not *Ruppia cirrhosa*.

The major habitat threat to this species in the reserve are the prolonged regional drought conditions and with their drawdown effects on the water level in the David Lake marshes where it was originally reported.

Management considerations for this species would entail resurveying the previously known and potential wetland habitats where it previously had been reported during a moister climatic period when David Lake hast higher water levels. Additionally, any vouching specimens should be reexamined and confirmed, since the record was not included by ANHIC (2002) and Kershaw *et al.* (2001) in their mapping for the province. At this time, it appears to be likely that the species has been extirpated from the vascular plant flora of the Ecological Reserve.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Ruppia cirrhosa* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION	
Exposure Type	not apply
Flood Hazard	not apply
Soil Drainage	very poorly (7)
Perviousness	slowly (3)
Site: Macro	plain (7)
Site: Meso	level (7), depression (6)
Site: Micro	straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	hydric (9)
Nutrients	?eutrophic (5), ?hypereutrophic (6)
Successional Status: 1	pioneer (1)
Successional Status: 2	not apply
Disturbance Factors	draining (8)

ANHIC RARE NATIVE PLANT REPORT	
Phenology: vegetative	no information (June to July?)
Phenology: reproductive - inflorescence	no information (June to July?)
Phenology: reproductive - flower	no information (July?)
Phenology: reproductive - fruit	no information (August?)
Habitat Threats	lake water level
Management Considerations	resurvey population habitats, confirm collections

APPENDIX 4

Elodea bifoliata St John.

—two-leaved waterweed—*HYDROCHARITACEAE*

This perennial aquatic herb of slough, pond, lake and stream habitats has a provincial Rank of **S1** in Alberta, and a global Rank of **G4G5** (Vujnovic & Gould 2002, ANHIC 2002). This species, which has also been known as *Elodea longivaginata* St. John, is rooted and completely submergent, with branching stems. It has paired leaves that are opposite, about 2.5 cm long and 2 mm wide and are not crowded in the middle to upper portions of the stem. Its flowers, have three tiny white petals, and are on long stalk-like tubes that extend from the leaf axils to the water surface, and produce a small capsule. It may readily be distinguished from *Elodea canadensis* Michx. (Canada waterweed), which has yet to be confirmed from the province, which has shorter (1.7 cm) and broader (2 to 4 mm) leaves that are in whorls of three and are notably crowded along the middle to upper stems. Additionally it differs from the more eastern *Elodea nuttallii* (Planch.) St. John (Nuttall's waterweed) which also has long, narrow (0.3 to 1.5 mm) leaves that are not crowded, but are in obvious whorls of three (Fassett 1957, Muenscher 1972, Voss 1967). At first glance it may be confused with the rare *Najas flexilis*, but that species has apparent whorls of four leaves (see preceding species summary).

This species occurs in the mid-western North America, is rare in Alberta and Saskatchewan and two northern states, and is considered to have been extirpated from one state (NatureServe 2003, Kershaw *et al.* 2001). It occurs in Alberta at eight known locations in the Grasslands and western Parkland and adjacent southern Boreal Natural Regions (ANHIC 2003). However, it was not mapped from the eastern portion of the Parkland Natural Region in *Rare Vascular Plants of Alberta* (Kershaw *et al.* 2001). Its only report from the Wainwright Dunes Ecological Reserve has been that of Fehr (1984), who listed it as "*Elodea canadensis*" in the general species list, but gave no location and did not include it in any of his community stand data tables. However, if it does occur within the Reserve, his stated habitat would indicate the pond to the southeast of the Great Fen as being one of several likely locations. The reference floral text for Alberta that Fehr probably used when he conducted his survey would have been the then recently published *Flora of Alberta* of Moss (1959) which listed both *Elodea canadensis* and *Elodea nuttallii*, and not the later version of 1983 which listed only *Eleocharis longivaginata* St. John in the province. *Elodea canadensis* is an aquatic species that still has not been confirmed from Alberta, and so his record may well have been an understandably mistaken identification of the rare *Elodea bifoliata*. However, Fehr's record was not repeated in the general accumulative species list that appeared in the Reserve's management plan (Anon 1998) which apparently was edited by several knowledgeable authorities, and who may have excluded the record as being unsubstantiated. The species was not observed during the 2002 survey of the Reserve, and hence its inclusion in its rare flora as based on this record is tentative.

There is no information on the number of individuals of this species within the Ecological Reserve, and the only likely habitat is "pools in willows and some beaver ponds" (Fehr 1984, Appendix 5), which could imply that is was recorded at several locations and in at least two habitats, although the pond southeast of the Great Fen is more probable. There was no information about associated species in the communities, although there may be several associated species of *Potamogeton* and other aquatics.

The major habitat threats to this species within the Reserve are the prolonged regional drought conditions and their effects on the water level in the beaver pond where it was originally reported. Such habitats were examined during the 2002 survey but no plants were recorded.

Management considerations for this species should include a resurvey during a wetter climatic period of the previously known and potential wetland habitats from which it previously had been reported by Fehr. Additionally, any existing vouching specimens should be found, reexamined and confirmed, since the record was included by neither ANHIC (2002) nor Kershaw *et al.* (2001) in their rare species mapping for the province.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Elodea bifoliata* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	not apply
Flood Hazard	not apply
Soil Drainage	very poorly (7)
Perviousness	slowly (3)
Site: Macro	plain (7)
Site: Meso	level (7), depression (6)
Site: Micro	straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	hydric (9)
Nutrients ?permesotrphic (4), ?mesotrophic (3)	
Successional Status: 1	pioneer (1)
Successional Status: 2	not apply
Disturbance Factors	draining (8)

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	no information (?June to July)
Phenology: reproductive – inflorescence	no information (?June to July)
Phenology: reproductive – flower	no information (?July)
Phenology: reproductive – fruit	no information (?August)
Habitat Threats	pond water level
Management Considerations	refind and monitoring populations

APPENDIX 5

Muhlenbergia asperifolia (Nees & Meyer *ex* Trin.) Parodi

—scratch grass—*POACEAE*

This distinctive low grass of moist alkaline soil has a provincial Rank of **S2** in Alberta, and a global Rank of **G5** (Vujnovic & Gould 2002, ANHIC 2002). It is a perennial grass that has a thin, scaled rhizome, with procumbent tips from which arise stems with somewhat keeled leaf sheathes, and a notably diffuse panicle, 4 to 12 cm wide, that is strikingly different from the other *Muhlenbergia* species in the province which have narrow, spike-like inflorescences. Indeed, its overall growth pattern, particularly when the bushy inflorescence is developed, is strongly reminiscent of *Panicum philadelphicum* (woodland witch grass) and *Panicum flexile* (wiry witch grass) of eastern and central North America, or of stunted, low-growing forms of *Panicum capillare* (witch grass), only the last of which also grows in Alberta. However, these other species are annuals, have very different glume sizes, and lack the well-developed overlapping scaled rhizomes that are typical of all species of *Muhlenbergia*. The open panicle has a delicate mauve to light purple colour which makes its presence readily obvious in its habitat, and when dry or mature, they break off from the plant and are blown about to spread their seeds. However, in its preflowering vegetative stages, it looks much like a stunted *Hordeum jubatum* (foxtail barley) and, indeed, probably frequently has been overlooked for this reason; at this stage the presence of rhizomes and lack of hairs on the upper surfaces of the leaf bases would identify the plants as *Muhlenbergia asperifolia* (Moss 1983, Gleason & Cronquist 1991, Fernald 1950).

This species occurs across southern Canada between British Columbia to Ontario (where it is an exotic) and across the United States except in the southern and New England states, and is considered to be rare only in Alberta, but extirpated in New York (NatureServe 2003). In Alberta it has 26 known locations in the Grasslands and eastern Parkland Natural Regions, with two from the general vicinity of the study area (ANHIC 2003). It was first reported from within the Wainwright Dunes Ecological Reserve by Wallis (1990) from the vicinity of the northern shore of David Lake. During the present survey thirteen new locations were discovered within the Ecological Reserve, and four from beyond its boundaries, in four general clusters near the David Lake peninsula and along the southwestern side of David Lake, with an extensive continuous population along the southeastern to eastern side of the lake.

The number of plants in its locations varied from 50 plants in a 1m X 2 m area with small, local dense to diffuse patches, to an outstanding virtually closed meadow of probably over 3 000 000 plants in a continuous, 150 m X 1 000 m area that extended along the eastern and southeastern offshore of David Lake, but unfortunately, beyond the Ecological Reserve's boundaries. The 2002 survey discovered 72 780 plants within the boundaries of the Reserve, all occurring at 13 locations around the David Lake basin.

The general habitat of this species within the province is "moist alkaline soil" (Moss 1983), and the survey of saline wetlands and springs in the Grasslands and Parkland Natural Regions by Wallis (1900) indicated its occurrence in a "drier community of *Hordeum jubatum, Puccinellia nuttalliana, Distichlis stricta*" (salt grass) north of Medicine Hat (Old Channel Springs Lake), occurring in association with the rare *Aster pauciflorus*, as is the case here. The behaviour of this species in the Ecological Reserve appears to be reliant of the drawdown condition of David Lake that exposes broad expanses of alkaline sandy soil with a mesic to subhygric moisture regime and, perhaps most importantly, a barren substrate to invade, which it does with a vengeance. The most spectacular habitat in the David Lake basin where the species formed a virtually closed short grass meadow occurs along the lake's entire southeastern and eastern sides. Where it occupied a shoreline to offshore zone that was 150 to 200 m wide, and extended for over 1 000 m along virtually the entire length of the shore. Here it formed three related zonal communities: nearshore (where it was at the higher limits of the normal lake level and formed a 20% to 50% meadow cover that was 20 to 50 m wide), farshore (where it joined *Glaux maritima* in forming a 5% to 20% cover as a 50 m wide zone), and offshore (where it formed a 1% to 5% cover in an closed offshore meadow that otherwise was strongly dominated by *Hordeum jubatum*). Off the eastern and southern shores of the David Lake peninsula, this species occurred on alkaline barrens that were more open but of a smaller extent, in effect being local barrens interspersed among the near- and offshore drawdown meadow communities. Here the species presented a variable cover of 2% to 20%, and often was associated with the populations of the rare *Aster pauciflorus* and *Carex parryana*. As well, the species occurred in the more densely developed, closed graminoid meadows that occupied the backshore and nearshore habitats, as in the southwestern side of David Lake. These were dominated by *Calamagrostis stricta*, *Juncus balticus*, *Hordeum jubatum* and *Agropyron trachycaulum* subsp. *trachycaulum* (slender wheat grass), and the species presented a 1% to 5% cover and occurred as an undercover species that often was most readily apparent where grazing had removed the taller grass cover. In at least one instance it displayed it ability to act as an invasive species when it occurred on the disturbed sands of the dugout ditch berm just to the east of the peninsula (site Ma11) with *Hordeum jubatum*, *Agropyron trachycaulum* subsp. *trachycaulum* and several invasive successional species.

As is the case with *Aster pauciflorus*, the main habitat threats to its present condition may well be the reestablishment of the high water levels in David Lake. Presently the plants have successfully invaded the shoreline to offshore zones of the lake basin, and have formed often extensive closed meadows. A return to high water lavels in the basin would drown the present populations. However, there probably is an outstanding seed bank that is produced by the profusely flowering inflorescences, and these seeds are bound to find refuge along the shore, even if as a much narrower zone. The plant appears to be intolerant of prolonged flooding, so the rhizome may not survive as a propagule with prolonged inundation. Grazing by cattle in the meadows of the David Lake basin appeared to have the effect of opening the cover of taller grasses to expose the shorter plants of this species, and perhaps even to 'release' them to present a denser and more vigorous growth. However, the cattle actually did not appear to selectively eat the species, and any impact appeared to be quite incidental.

Management considerations for *Muhlenbergia asperifolia* in the Wainwright Dunes Ecological Reserve should include monitoring the populations in the David Lake basin to determine if there is any grazing impact. Additionally, the northwestern, western and southeastern portions of the David lake basin were not surveyed in 2001, and it is very likely that other populations would also be discovered there with further survey. In moister climatic conditions when the drought conditions cease and the lake water level is restored, further surveying should be conducted to determine changes in the extent of the populations, and to see if the plants appear elsewhere along the shores. Also, a further survey should examine the shores of the Great Fen pond and the other streams and seeps within the reserve; while no populations were discovered in these habitats in 2002, nevertheless, at least small local populations may be expected.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Muhlenbergia asperifolia* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	not apply
Flood Hazard	may be expected (3)
Soil Drainage	poorly drained (6), imperfectly drained (5), moderately well drained (4)
Perviousness	slowly (3), moderately (2)
Site: Macro	plain (7), valley floor (6)
Site: Meso	level (7), depression (6)
Site: Micro	straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	hygric (7), subhygric (6)
Nutrients	?hypereutrophic (6)
Successional Status: 1	young seral (2)
Successional Status: 2	pioneer (1)
Disturbance Factors	water related (8), grazing (5)

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	mid- to late July, early to mid-August
Phenology: reproductive – inflorescence	mid- to late August
Phenology: reproductive – flower	mid- to late August, early September
Phenology: reproductive – fruit	mid- to late August, early to late September
Habitat Threats	flooding, grazing
Management Considerations	monitoring populations, limiting access

Photo: *Muhlenbergia asperifolia*

plant detail: plant habit with inflorescence at early to mid-flowering

(Ma2—Muhlasp-020815b - O18, photo Ian D. Macdonald)

APPENDIX 6

Carex crawei Dewey

— Crawe's sedge—*CYPERACEAE*

This low to medium height lowland sedge has a provincial Rank of **S2** in Alberta, and a global Rank of **G5** (Vujnovic & Gould 2002, ANHIC 2002). It is a perennial graminoid, with well-developed rhizomes, and has persisting clusters of the previous year's leaf bases. It has a single terminal staminate spike that is well-separated from the two to three sessile pistillate spikes, and has leaf-like bracts along the stem. The perigynia are glabrous and have three stigmata that develop from green when young to beige with small reddish glandular dots on its surface when mature, with light reddish-brown hyaline scales. A first glance, the species resembles small plants of *Carex lanuginosa* or others of the Section *Hirtae*, except that the perigynia are glabrous, not densely if minutely hiruste. Contrary to the comparisons indicated in *Rare Vascular Plants of Alberta* (Kershaw *et al.* 2001), the specimens located during this survey did not at all bear any resemblance to *Carex aurea*, which is a much more delicate plant with orange globose perigynia. Its closest resemblance is to *Carex granularis* which extends from the east only as far as Saskatchewan, and rather has its staminate spike immediately proximate to the pistillate spikes.

This widespread Northern American species occurs in all the provinces except Nova Scotia and is rare in four other provinces, including Saskatchewan and New Brunswick, and possibly as an extirpated species in British Columbia and Newfoundland - Labrador. As well, it occurs in over two-thirds of the United States and is rare in 13 states, and extirpated from two states (NatureServe 2003, Kershaw *et al.* 2001). It has a very limited occurrence in Alberta with 13 known locations in the northern and central Rocky Mountain, northeastern Grassland and eastern Parkland Natural Regions (ANHIC 2003), with its nearest location less than 25 km from the study area, on the low border of Rough Lake, southeast of Wainwright, collected by K.E. Tannas in 1978 (ANHIC 2002, 2003; Moss 1983). Within the Wainwright Dunes Ecological Reserve, it was first reported by Cottonwood Consultants, Ltd. (1986) from the Great Fen basin and from the northwestern end of the large pond near it. In 1992, Derek Johnson and Patsy Cotterill, and again in 2001, Patsy Cotterill and Margaret Meijer reported five locations north of the David Lake shore. During the present survey, however, it was found only once, unfortunately outside the Reserve, again in the backshore zone along the north shore of David Lake. Searches in the previously reported locations or in potentially suitable habitats within the study area did not rediscover any additional individuals of this species.

The previous records of Cotterill and Meijer (2001) indicated that "hundreds" of plants of this species were located along the aspen grove on the north side of David Lake. However, searches during the 2002 survey did not rediscover any plants in the backshore grove or tall thicket habitats. However, the current study did discover a small population from the northern backshore of David Lake, but just outside the Ecological Reserve's eastern boundary, with 13 plants occurring in a tight 0.4 m X 0.7 m cluster, and with most of the plants presenting a developing inflorescence that by early July had at least young fruits that were well on their way to maturing. Since the population was beyond the Reserve's formal study area, only a portion of the potential habitat could be surveyed; there is potential, however, for "hundreds" to occur at that location.

The habitat conditions for the species across the province generally appear to be "calcareous meadows" (Kershaw *et al.* 2001, Moss 1983). Within the Reserve they were reported to include a patterned fen in the "extensive beaverpond and fen complex" at the Great Fen to the northwest of David Lake, and from an "imperfectly drained edge of an aspen grove" near the lake's northern backshore (ANHIC 2002). The populations that were discovered during the 2002 survey occurred in a subhygric seepage backshore semiopen tall thicket of *Salix pseudomonticola, Betula occidentalis, Carex lanuginosa, Juncus balticus* and *Crepis runcinata* (scapose hawk's-beard), in association with other calcareous seepage habitat herb cover species of *Carex aurea* (golden sedge), *Carex viridula, Eleocharis quinqueflora, Primula incana, Senecio pauperculus, Deschampsia cespitosa,* and notably with the rare *Gentiana fremontii.*

Habitat threats to the plants occurring here may be related to the prolonged drought conditions between 2000 and 2002 around the wetlands and lake basin. It is apparent that the subsurface seepage flow along the northern backshore of David Lake has been reduced and what now are subhygric moisture regimes probably were in the past at least hygric in moisture climatic conditions. Prolonged drought may induce the invasion and establishment of a more closed shrub cover that may affect the plants. The Great Fen complex currently still has standing water, but evidently not as much as when the species was originally found here, and searches in 2002 did not rediscover the species there. In the case of the population occurring east of the reserve, a conversation with the local rancher, Hilson Maull, indicated that the entire thicket complex along the north shore of David Lake outside the Reserve boundaries was under forest cover to the mid 1990s, but was cut and brushed out to improve grazing capability. This activity must have influenced the present thicket community which is still relatively rich in fen species, including two rare plant species, Carex crawei and Gentiana fremontii. The cattle grazing pattern in the area outside the Reserve boundaries occurred as grazing corridors only a meter or so wide that meander through the community. As well, the cattle use the thicket as a movement corridor at this location, creating several well-worn, east to west trails, with only minor grazing along their immediate margins. Within the Reserve boundaries, no grazing was noted in the Great Fen area, but it was present at a light intensity in the thickets north of the lake.

Management concerns should include monitoring the recently discovered population and attempting to rediscover the previously reported populations, perhaps in moister climatic conditions. It is likely that additional populations occur in suitable seepage and fen-like wetland situations not only along the northern end of the lake, but also along its southern and western sides. An investigation of the reported cutting of the backshore forest for grazing improvement should be undertaken to determine its extent and dates, and whether this activity has damaged or actually improved the habitat for this and the rare gentian species. Since the prolonged drawdown of the water table and lake level probably will advance the invasion of more mesic species into the habitats, any future monitoring should identify the extent of this potential impact.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Carex crawei* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION	
Exposure Type	frost (4)
Flood Hazard	none
Soil Drainage	imperfectly drained (5), poorly drained (6)
Perviousness	moderately (2)
Site: Macro	plain (7), valley floor (6)
Site: Meso	level (7)
Site: Micro	straight (1), hummocks (2)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	subhygric (6), hygric (7)
Nutrients	?permesotrophic (4)
Successional Status: 1	young seral (2)
Successional Status: 2	not apply
Disturbance Factors	site improvement (7), water related (8), grazing (5)

ANHIC RARE NATIVE PLANT REPORT	
Phenology: vegetative	mid-June
Phenology: reproductive – inflorescence	late June, early July
Phenology: reproductive – flower	early July
Phenology: reproductive – fruit	mid- to late July
Habitat Threats	thicket clearing, water table fluctuation, grazing
Management Considerations	monitor population, determine brushing impact

Photo: *Carex crawei* (Crawe's sedge)

plant detail: inflorescence with young perigynia

(Cc5—Carecra-020711b – E11, photo Ian D. Macdonald)

APPENDIX 7

Carex houghtoniana Torr. *ex* Dewey

—sand sedge—*CYPERACEAE*

This upland sedge of dry sandy and gravelly acid sites, gravel pits and open forest habitats has a provincial Rank of **S2** in Alberta and a global Rank of **G5** (Vujnovic & Gould 2002, ANHIC 2002). It is a medium-sized perennial erect sedge that spreads by rhizomes, and that has stiff leaves and culm. It has one to several staminate spikes that are well-separated from the two pistillate spikes, with notably hairy perigynia that are 5 to 7 mm long. This species is similar to the other two members of the Section *Hirtae* occurring in Alberta, *Carex lanuginosa* and *Carex lasiocarpa*, except that its perigynia are longer (rather than from only 2 to 5mm long in the above), have distinct, coarse, rib-like veins on its surface (rather than relatively less protrusive veins), have perigynial scales that are notably acute to awned (rather than merely acute), and are shorter than the perigynia (rather than about as long). The foliage tends to be somewhat yellowish green (rather than green to occasionally bluish green), and invariably itis a species of dry, coarsely textured substrate (rather than wetland sites). Additionally, its notably pubescent perigynia separate it from another rare, wetland species, *Carex crawei*, that also occurs in the Ecological Reserve and has a similar but smaller growth habit.

This species occurs across Canada eastward of the Rocky Mountains, and also is rare in Newfoundland and three states (NatureServe 2003, Kershaw *et al.* 2001). In Alberta it has 11 known locations with concentrations in the lower elevations of the Rocky Mountain Natural Region west of Edmonton, with isolated locations near Fort McMurray and on the Canadian Shield (ANHIC 2003). It was not mapped from the Parkland Natural Region in the ANHIC (2002) data base, nor in *Rare Vascular Plants of Alberta* (Kershaw *et al.* 2001). However, the significant features map in Cottonwood Consultants, Ltd. (1986) indicated that the species occurred within the northwestern portion of the Ecological Reserve northwest of David Lake. C. Wallis (2002) confirmed that this was his record and that he was confident of the record, and further, he thought that he had made a collection that may be at the University of Alberta herbarium. No specimen was found at the provincial parks herbarium. The potential habitats in the general location of his record were surveyed during the 2002 project, but in only one instance was the plant thought to be found, although formal determination of the vouching specimen realized that this population actually was *Carex lanuginosa* occurring in an extremely unusual upland situation.

The typical habitat for this species is a variety of dry upland situations, including gravel pits, sandy & gravelly acid sites, and open forests. Wallis' record had the species occurring in an active sand dune blowout with light grazing, but no specifics of the habitat or population were available. The active blowout site where the *Carex lasiocarpa* population was located during the current survey was an otherwise typical, very dry blowout of extremely open sand with *Calamovilfa longifolia, Carex pensylvanica* var. *digyna, Prunus virginiana* and the rare *Shinneroseris rostrata* and *Cyperus schweinitzii.*

The habitat threats to this species in a blowout situation would be erosion or drifting sand, and the source report (ANHIC 2002) indicated that grazing may have a minor impact. However, the potential locations examined did not present serious impacts from either of these disturbances.

The management considerations for this species would be to confirm the existence of this species within the Ecological Reserve, either through finding and confirming any specimens, or refinding the actual population. In the interim, some measure of access control to the area may be required since signs of ATV trails were in the immediate vicinity. Otherwise the location is remote enough to have had very little human or cattle visitation in the past decade.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Carex houghtoniana* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	wind (2), insulation (3)
Flood Hazard	none
Soil Drainage	well drained (3), rapidly drained (2)
Perviousness	rapidly (3)
Site: Macro	plain (7)
Site: Meso	?midslope (3)
Site: Micro	straight (1)
Site: Surface Shape	concave (2)
Ecological Moisture Regime	xerix (2), very xerix (1), subxeric (3)
Nutrients	?submesotrophic (2)
Successional Status: 1	pioneer (1)
Successional Status: 2	not apply
Disturbance Factors	not apply

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	no information
Phenology: reproductive - inflorescence	no information (?June to July?)
Phenology: reproductive - flower	no information (?June to July?)
Phenology: reproductive - fruit	no information (?July to August)
Habitat Threats	blowout erosion
Management Considerations	finding & monitoring populations, limiting access

APPENDIX 8

Carex parryana Dewey var. *parryana* —Parry's sedge—*CYPERACEAE*

This perennial semicespitose sedge of moist open meadows, swales and other lowland habitats has a provincial Rank of **S1S2** in Alberta, and a global Rank of **G4T4** (Vujnovic & Gould 2002, ANHIC 2002). The plant has stiff basal leaves that rise in loose tufts with reddish-tinted bases from a rhizome. There is an erect, obtusely triangular culm that is topped by a tight, narrow inflorescence of stiffly ascending terminal and lateral spikelets, with small perigynia and short staminate spikelets thct are crowded at the base of the terminal spike, and a very short, sheathless bract at the base of the bottom spikelet. There is only one sedge species in the ecological reserve that shares its habitats and initially could be confused with this distinctive species, *Carex scirpoidea*. While this sedge also has stiffly erect culms and basal leaves, it differs in having pubescent perigynia in a single, densely fruited, cylindrical spikelet (Moss 1983).

This species occurs in the northwestern quarter of North America, and also is rare in Ontario, and in Wyoming (NatureServe 2003). In Alberta it has 24 wide-spread known locations in the central Rocky Mountain, Parkland and Grassland Natural Regions, with several known populations in alkaline and salty springs and shore sites occurring within 30 km of the Ecological Reserve (ANHIC 2003, Kershaw *et al.* 2001). There were four previous records within the Reserve from the northern shore and vicinity of the peninsula of David Lake, originally recorded by Fehr (1984), Cottonwood Consultants, Ltd (1986) (although not mapped by them), Wallis (1990) and Meijer (2001). The survey in 2002 discovered an additional nine records from within the Reserve around the David Lake basin, with the greatest known concentrations near the David Lake peninsula and the bay on the lake basin's western side. Additionally, several smaller scattered species locations were recorded on the general grassland in the inland body of the peninsula, in the hummocky seepage meadows and in the lake basin's northern backshore. As well, an additional four new records were discovered from the eastern side of the basin, but outside of the Reserve's boundaries, with the probability that similar populations also extend along the southeastern side of the basin's offshore.

The numbers for this species within the general vicinity of David Lake totaled 23 646 individuals, as based on actual counts of culms and basal leaf clusters. Even recognizing that with its rhizomatous character, each individual plant of this species may produce several such clusters, the population still is notable for the province. And, it is likely that many more individuals also occurred elsewhere around the periphery of the lake basin. Within the Ecological Reserve boundaries there were 12 621 individuals counted in 13 sampled sites, and outside the boundaries there were 11 025 individuals in four sampled sites. The number of plants at the sites varied from about 20 to over 10 000 individuals in areas from 4 m X 5 m, to over 100 m X 100 m. As well, along the peninsula's eastern side they occurred as a zone 35 m wide and 200 m along the offshore that encompassed 17 widely spaced concentrations with 355 individuals. In 2002, the populations within the reserve were setting leaves and very young inflorescence buds by mid-June, with the inflorescences in full development and in flower by mid- to late June to early July, and with fruit development proceeding from mid- to late June through to mid- or late July.

The inventory of saline wetlands and spring habitats by Wallis (1990) described this species as being a "facultative wetland species, (occurring) in springs" with no other comment in his summarizing species list; however, he also indicated that "(*Carex parryana*) occurs occasionally on hummocks ... and ... most forbs in this wettest portion of the springs (i.e., wet spring meadows) also occur on hummocks" (page 14), and that it occurred "at Dune Point Springs' saline springs with an open drier area of *Distichlis stricta, Puccinellia nuttalliana* ... with *Aster parviflorus*" (page 41). In the Reserve, the largest concentrations of the species around the David Lake basin occurred in the nearshore and offshore drawdown alkaline meadows which are essentially level, and in the hummocky terrain that was created by cattle trampling and grazing patterns. Due to the drought conditions at the time of the 2002 survey, both of these formerly hygric to subhydric habitat situations were mesic to subhygric at best. The community associated with the species was a semiclosed to semiopen graminoid meadow of *Distichlis stricta, Calamagrostis stricta, Carex praegracilis* (graceful sedge), *Deschampsia cespitosa, Agropyron trachycaulum, Juncus balticus, Antennaria parvifolia, Potentilla anserina* and others, and it was associated with the rare *Aster pauciflorus* and *Muhlenbergia* *asperifolia*. This habitat usually extended some 50 to 100 m offshore, but not into the increasing concentration of *Hordeum jubatum* cover that continued as the dominant cover further out into the basin. Backshore and nearshore habitats on the northern and western sides of the lake basin supported rather richer, more closed meadow communities, often with several calcareous seepage associated species that occurred, at least as traces. Typical of these communities were *Deschampsia cespitosa, Calamagrostis stricta, Juncus balticus, Agropyron trachycaulum, Glaux maritima, Sonchus uliginosus, Dodecatheon pulchellum, Primula incana, Crepis runcinata* and others. Back from the lake basin near the base of the peninsula were several strongly-developed hummocky meadow sites which supported local and small populations of the sedge. These had closed, tight carpets of *Antennaria parvifolia, Carex stenophylla* var. *eleocharis* (low sedge), *Carex scirpoidea, Deschampsia cespitosa, Juncus balticus* and others, and may well also have been a habitat for the rare *Gentiana fremontii*. This habitat apparently occurred on calcareous seepage slopes that normally were hygric, although they were virtually submesic during the 2002 drought conditions. The hummocks themselves appeared to have been created by the trampling of cattle moving through the sites in the wetter conditions, although little grazing was evident during the 2002 survey. These habitats currently supported only very sparse groups of the sedge, but they have potential to have more away from the lakeshore in moister times.

Any habitat threats to the recent plant locations in the lake basin and backshore sites must be related to the prolonged regional drought conditions. The drawdown conditions of the lake level undoubtedly has extended the potential habitat for the species considerably around the David Lake basin. This habitat supported over 85% of the reserve's population, while during moister climatic conditions the plants probably would be limited to the more narrow shoreline zones around the lake. On the other hand, wetter conditions would revitalize the populations in the seepage slope hummocky meadows which occurred in at least eight depressions in the gently rolling sandland back from the basin's northwestern side. Grazing by cattle did not appear to present a significant impact on the plant locations; the coarseness of the leaves and culms did not appear to be favored over the relatively more palatable grasses in the same habitat.

Management concerns for the species at this time should include monitoring the populations around the David Lake basin and in the hummocky seepage slope meadows, particularly concerning the long term impacts of the prolonged drought conditions on the foliage and seed production. As noted above, grazing by the resident cattle did not appear to present a problem for the populations here, although such pressures should also be monitored.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Carex parryana* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	not apply
Flood Hazard	may be expected (3)
Soil Drainage	moderately well drained (4), imperfectly drained (5), poorly drained (6)
Perviousness	slowly (3), moderately (2)
Site: Macro	plain (7)
Site: Meso	level (7), depression (6)
Site: Micro	hummocky (2), straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	subhygric (6), hygric (7), subhydric (8)
Nutrients	?hypereutrophic (6), eutrophic (5)
Successional Status: 1	young seral (2)
Successional Status: 2	not apply
Disturbance Factors	water related (8)

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	early to mid-June
Phenology: reproductive – inflorescence	early to mid-June
Phenology: reproductive – flower	mid-June to early July
Phenology: reproductive – fruit	mid- to late June, to mid- to late July
Habitat Threats	flooding, grazing
Management Considerations	monitoring populations and grazing impacts

Photo: *Carex parryana* (Parry's sedge)
plant detail: vigorous growth in drawdown lake meadow
(Cp11—Carepar-020710c – D15, photo Ian D. Macdonald)

APPENDIX 9

Cyperus schweinitzii Torr.

—sand nut-grass—CYPERACEAE

This distinctive perennial graminoid of dry sand, active sand dune sites has a provincial Rank of **S2** in Alberta, and a global Rank of **G5** (Vujnovic & Gould 2002, ANHIC 2002). It has a rhizome that produces corm-like thickenings at its tip, with narrow, scabrous, 2 to 10 cm long basal and lower culm leaves. The culms are scabrous and triangular and are 10 to 70 cm tall, with several leafy bracts at its top, and several inflorescences on subsessile to 10 cm long branches. Each inflorescence tipped with a dense cluster of 1 cm long spikelets that have alternately-arranged, acuminate, brownish scales and small, hard, brown achenes. There literally is no other medium-height plant in Alberta that resembles this species, except perhaps for certain members of the genus *Scirpus*, which have a round to oval-shaped spikelet arrangement rather than the regimented planar array of alternate florets that are evident in the genus *Cyperus*. Its nearest relative is a more eastern species, *Cyperus houghtonii* that does not enter Alberta, and which has a slightly smaller growth habit, obtusely angled, smooth culms, smooth leaves, and obtuse scales. In its vegetative state it initially may be mistaken for *Carex pensylvanica*, but that species differs in having very fibrillose rhizomes. In the early summer, the plants of this species may readily be recognized by the accumulation of the previous several years' old culms and inflorescences that form a greying carpet of detritus at the plant bases, creating a somewhat dingy aspect to the lower slopes and bases of the sand dune blowouts. The drought conditions did not appear to greatly affect the growth of this species during the 2002 survey of the Reserve, understandably, since it is a very dry habitat species. This plant often occurred in a general association with the rare *Shinneroseris rostrata*, and perhaps also with *Carex houghtoniana* and *Chenopodium leptophyllum*.

This species occurs in seven provinces from Alberta to Quebec and in 29 states from New England to Texas and the central and mid-western states. It also is rare in Manitoba and Saskatchewan and in eight states including Montana (NatureServe 2003). It occurs in southeastern Alberta with 14 very isolated known locations in the Grassland and Parkland Natural Regions (Kershaw *et al.* 2001, ANHIC 2003). The location at Wainwright Dunes

Ecological Reserve appears to have the only known concentration in the eastern Parkland (Kershaw *et al.* 2001). The species was previously recorded from here by Fehr (1984), Cottonwood Consulting, Ltd. (1986) and Derek Johnston (1992) who together discovered ten locations, with all but one from within the Reserve boundaries. The 2002 survey rediscovered two of these general locations, and added an additional three general clusters with an additional 16 species locations. These were all associated with the eroded dune ridge landforms and were located as clusters to the west, northwest, north northwest and north of David Lake.

The number of plants of this species that were counted in 2002 within the Ecological Reserve's boundaries totaled 9 123 plants in the four clusters of 15 sites that were sampled. The number of plants the varied from 35 to over 3 000 individual basal leaf clusters with associated culms with inflorescences in areas of from 3 m X 7 m, to 30 m X 85 m. Unfortunately, none of the previous records for the species included population information, except the indications of "very rare". In most cases, the leaf clusters were in fact connected by rhizomes, with at least five per rhizome, and these plants formed a semiopen to semiclosed, low graminoid cover on the blowout sand habitat. In 2002, the plants started to develop leaves in late May to early June, and the leaves were at least half developed by mid-June, and fully developed by mid-July. The culm started to develop by mid-June, and was fully extended by mid-July, and the inflorescence probably was initiated by late June and was mature by mid- to late July. The flowering phase appeared to initiate in early July and continued through mid-July to essentially end by late July. Submature fruits were present by the third week in July and mature fruits were prevalent by mid- to late August. In only one location did the entire group of plants not produce any inflorescences; in all the rest at least 50% to 70% of the plants were fertile. As indicated above, the bases of the sandy blowout slopes had notable accumulations of the old inflorescences, and presumably fruits, from the previous years. With the additional moisture and litter, these conditions may provide an opportunity for successful seed germination and seedling survival success.

The sole habitat that this species occupied within the Reserve was the xeric to subxeric, semiactive, semiopen to open sand in the middle to lower slopes of the erosion faces on the southwestern-facing sides of the sand dune ridges. The populations often formed a semiopen cover in association with other dune habitat species, notably *Calamovilfa longifolia, Carex pensylvanica* var. *digyna, Koeleria macrantha, Carex obtusata, Carex siccata, Festuca saximontana, Stipa curtiseta, Helianthus couplandii, Heterotheca villosa, Artemisia campestris,* the moss *Tortula ruralis* and others, including the provincially rare *Shinneroseris rostrata* and *Chenopodium leptophyllum,* and possibly also *Carex houghtoniana.* The lower slope and the ridge slope draw habitats tended to have a somewhat denser concentration of plants and appeared to initiate their growth earlier in the season; this may have been due to increased soil moisture along the slope base zone. It was not until the mid-summer survey period that plants were noted along the mid- to lower slopes, although by then these often appeared to have formed semiopen to semiclosed covers at the same phenological development stage as at the slope bases. The blowout basins tended to have relatively closed meadows of the *Calamovilfa longifolia, Koeleria macrantha,* and other associated species, including often very closed carpets of *Hudsonia tomentosa* and several species of lichen, notably *Cladonia mitis, Cetraria ericetorum, Caldonia uncialis, Cornicularia aculeata* and others. However, the population of the *Cyperus* appeared to avoid extending into these more stablized, closed carpets and meadows.

There were no immediate habitat threats to the populations in the reserve. Associated with the sand dune ridge blowout situations were wind-caused erosion and deposition, although only two groups of the species were developed on actively depositing sand and appeared to be maintaining their growth, and no populations appeared to be seriously eroding. Nevertheless, at one location there were signs of recent unauthorized all terrain vehicle ("quad") use in the blowouts, and this may impose an occasional local threat. Additionally, one very local population (Cs26) was not producing any fruits in 2002, although, judging from the previous year's accumulation of productive culms and inflorescences, there was normal production in 2001; this may indicate a failing population, but the situation was by no means typical of anywhere else in the Reserve. Management considerations for maintaining the species in the reserve at this time should include monitoring the size and vigor at the known plant locations. As well, a further survey should include the discovery of additional locations for the plants, since probably only about half of the blowouts in the Ecological Reserve could be examined during the

2002 survey. Measures should be taken to discourage unauthorized off-road vehicle use in the area, particularly in the vicinity of active sand sites.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Cyperus schweinitzii* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION	
Exposure Type	wind (2), insulation (3)
Flood Hazard	not apply
Soil Drainage	rapidly drained (2), well-drained (3)
Perviousness	rapidly (1)
Site: Macro	not apply
Site: Meso	mid-slope (3), lower slope (4), toe (5)
Site: Micro	straight (1)
Site: Surface Shape	concave (2)
Ecological Moisture Regime	very xeric (1), xeric (2), subxeric (3)
Nutrients	?submesotrophic (2)
Successional Status: 1	pioneer (1)
Successional Status: 2	not apply
Disturbance Factors	not apply

ANHIC RARE NATIVE PLANT REPORT	
Phenology: vegetative	late June to mid-July
Phenology: reproductive – inflorescence	late June to mid July
Phenology: reproductive – flower	early to mid- to late July
Phenology: reproductive – fruit	mid- to late July, and early to mid-August
Habitat Threats	wind erosion and drifting, recreation
Management Considerations	monitoring populations and drought impacts

Photo: *Cyperus schweinitzii* (Sand nut-grass)

plant detail: growth habit

(Cs16—Cypesch-020715c – H2, photo Ian D. Macdonald)

APPENDIX 10

Eleocharis elliptica Kunth

—slender spike-rush—*CYPERACEAE*

This is a slender graminoid of non-acidic wetlands that has a provincial Rank of **SU** in Alberta, and a global Rank of **G5T5** (Vujnovic & Gould 2002, ANHIC 2002). It may be distinguished from other spike-rush species by its notably fasciated, or flattened, culm that has a loose reddish purple sheath at its base, and has an achene that is somewhat triangular, distinctly yellowish, with a minute ridge around its crest surrounding its beak. This species recently has undergone some taxonomic revision, with former treatments including *Eleocharis tenuis* var. *borealis* and *Eleocharis compressa* var. *borealis* (Kershaw *et al.* 2001). Fehr (1984) reported "*Eleocharis compressa* var. *borealis*" from a shrubby fen in his community stand 021, in the vicinity of Ribstone Creek area to the west of the ecological reserve boundary. During the survey in 2002, the author also collected a plant with fasciated culms and entire brownish culm-bases, also tentatively identified as *Eleocharis compressa* (Macdonald 020719d6). This species is included in this discussion pending confirmation of the specimens from the study area. At the time of writing, Gould (2003) related that the Reserve's collected plant material is possibly *Eleocharis elliptica.* However, there is another rare species, *Eleocharis mamillata* that should be considered. They differ in that the former has proximal bract scales that completely envelop the culm top, while the latter's scles only partially envelop the culms.

This species extends across central and northern North America, occurring in 9 provinces and 24 states, and is rare in Alberta and Saskatchewan, and in one state (NatureServe 2003). It has been mapped in *Rare Vascular Plants of Alberta* (Kershaw *et al.* 2001) from one location in the southern portion of the Boreal Forest Natural Region to the west of Edmonton but from only one location in the northwestern portion of the Parkland Natural Region, with none from its eastern portion (ANHIC 2003, Kershaw *et al.* 2001). Fehr's 1984 report recorded it from the vicinity of Ribstone Creek, west of the Wainwright Dunes Ecological Reserve's boundaries, but Macdonald collected it from a beaver dam southeast of the Great Fen.

The number of individual plants for this species occurring in the Reserve could not be accurately determined. Fehr gave no number of plants, except that it evidently was "rare", presenting a 0.5% cover in his sample plots. Macdonald's incidental collection from within the Reserve was of two plants from a concentration of at least 6 plants that presented less than a 1% cover in its habitat.

The habitat within the Ecological Reserve was a shrubby mixed marsh meadow fringe along a subhygric beaver dam with an extremely open low shrub cover of *Cornus stolonifera*, and a semiclosed mixed marsh cove of *Scirpus microcarpus* var. *rubrotinctus, Carex urticularia, Lycopus americanus, Lycopus asper, Glyceria striata* and others. The habitat to the west of the Reserve was recorded by Fehr (1984) as being a subhydric shrubby graminoid fen along the creek in a flat stream valley basin with a semiopen thicket of *Betula pumila, Salix canescens* and *Cornus stolonifera* , and a semiclosed herb cover of *Carex aquatilis, Carex utriculata, Eriophorum polystachion, Galium boreale, Carex livida, Menyanthes trifolia* and others.

Any habitat threats to the potential number of plants within the Reserve and its vicinity would be related to the drawdown effects of the prolonged drought situation on the beaver ponds and dams, which might change the habitat conditions enough to be unfavourable for the species to survive or to allow other plants to out-compete it. Since the dam crest site also was shared with wildlife and possibly cattle as a trail for crossing the waterway, their trampling or incidental grazing may have an impact.

Management concerns for this species first should be to find and confirm the determination of the collections of Macdonald and, if any exist, of Fehr. The populations also should be refound and monitored to determine the impact of the drought and incidental wildlife and cattle movement and browsing.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Eleocharis elliptica* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	frost (4)
Flood Hazard	not apply
Soil Drainage	imperfectly drained (5), poodly drained (6)
Perviousness	moderately (2)
Site: Macro	not apply
Site: Meso	depression (6), level (7)
Site: Micro	irregular (5), straight (1)
Site: Surface Shape	straight (1), concave (2)
Ecological Moisture Regime	hygric (7), subhygric (5), subhydric (8)
Nutrients	?mesotrophic (3)
Successional Status: 1	young seral (2)
Successional Status: 2	not apply
Disturbance Factors	water (8)

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	mid- to late June to early July
Phenology: reproductive – inflorescence	no information (?May)
Phenology: reproductive – flower	no information (?June)
Phenology: reproductive – fruit	no information (?August)
Habitat Threats	drought drawdown of stream
Management Considerations	monitoring populations

APPENDIX 11

Chenopodium leptophyllum (Nutt. *ex* Moq.) Nutt. *ex* S. Wats.

— narrow-leaved goosefoot—*CHENOPODIACEAE*

This annual herb of sandy, open and wooded habitats has an provincial Rank of **SU** in Alberta, and a global Rank of **G5** (Vujnovic & Gould 2002, ANHIC 2002). It is an erect plant with narrow, lanceolate to linear (rather than broad) leaves that are seasonally farinose (mealy) and tend to be a bluish or light green colour. It has an open panicle of minute green flowers developed in the upper leaf axils and at the terminal growing points of the stem. The determination of this species in the field is considerably problematic since it may be confused with several other common and rare species of *Chenopodium.* Of particular difficulty is the recognition of the defining minute characteristics without a microscope, such as the flower and fruit pericarp. The combination of leaves with a strictly single vein and absolutely no shorter side veins at the underside bases of the larger leaves, a tight pericarp (thin skin) that closely sticks to the horizontally oriented seeds that, at least at maturity, cannot easily be scraped off the seed, and seeds with a black but slightly wrinkled coating (testa), should separate it from the following four species. The common *Chenophyllum pratericola* (goosefoot) also is erect, but has leaves with three veins, that often must be very carefully looked for, particularly at their base, and are mealy at least to mid-season, and has a loose pericarp that can readily be separated from the seed. The rare *Chenophyllum atrovirens* (dark-green goosefoot, S1 G5) has smaller calyx-lobes that do not cover the mature seed, the plant is somewhat ascending rather than erect, and the larger leaves often have basal lobes. The rare *Chenophyllum dessicatum* (dried goosefoot, S1S2 G5) also shares small calyx-lobes, but has a loosely attached pericarp, a seed with a dark, shiny, smooth coating, three-veined leaves, and branches notably from the base. The rare *Chenophyllum subglabrum* (smooth narrow-leaved goosefoot, S1 G3G4) also has a single vein in the leaves, but is quite glabrous except perhaps in the inflorescence, and has a larger seed, about 1.5 cm long, with a loose pericarp. This is the first record of this species from the Ecological Reserve. However, there is some dispute about the determination of the vouching specimens which may appear to have loosely adherent pericarps, and indeed, may well be another provincially rare species, *Chenopodium* *dessicatum* (K. Vujnovic 2002, Moss 1983, Gleason & Cronquist 1991).

This species occurs in the western and central portions of the continent, in six provinces and 37 states. While its provincial Rank is being confirmed in Alberta, it is known to be rare in Ontario and extirpated from Nova Scotia, and is rare in four states (NatureServe 2003, Kershaw *et al.* 2001). In Alberta, it appears to have scattered locations in the Grassland and Parkland Natural Regions, with at least one station reported from just beyond the northeastern edge and to the south of CFB Wainwright; however, there is no accurate information confirming the number of known locations in the province (ANHIC 2003). This is the first report of the species from the Wainwright Dunes Ecological Reserve, with a cluster of seven locations in its southwestern portion, west of David Lake; the species was not reported in any of the previous biophysical surveys (Fehr 1984, Cottonwood Consultants, Ltd. 1986, Anon 1998). This concentration may be an under representation related to the late seasonal development of the plants and their discovery only late into the 2002 survey period. Hence, the species may well have been overlooked prior to development of the inflorescence, or mistaken for the widespread *Chenopodium pratericola.* Fehr's 1984 report on the area did not include the species, nor any of the subsequent lists.

A total of 164 individual plants were counted in the seven locations in 2002, all occurring within the Reserve boundaries, possibly with several others to the southwest, which, however, were not properly investigated. The population numbers varied from a single to over one hundred plants in sampled areas of less than 0.1 m X 0.1 m, to 3 m X 45 m.

The main habitat of this species was the sand dune blowout erosion slopes that it shared with the other rare species, *Shinneroseris rostrata* and *Cyperus schweinitzii.* This habitat generally was the middle to upper blowout slopes that face southwest to southeast on xeric, semiactive to active, bare sand in association with an open community of *Stipa curtiseta, Calamovilfa longifolia, Carex pensylvancia* var. *digyna, Carex siccata, Helianthus couplandii, Lygodesmia juncea, Carex obtusata, Heterotheca villosa* and others, including the common *Chenopodium pratericola.* In one instance it was situated on the relatively level ground of a subxeric sand plain in an open shrubby grassland of

Amelanchier alnifolia, Prunus virginiana, Stipa curtiseta, Agropyron trachycaulum, Festuca campestris, Koeleria macrantha, Selaginella densa and others. It possibly has other upland habitats in the Reserve, but they may have been overlooked in the earlier seasonal phases of the 2002 survey.

The habitat threats to this species would include erosion and deposition of sand from the blowouts, and the long-term effects of the prolonged drought in the region. Grazing from cattle was virtually non-existent in the southwestern portion of the reserve, but may be more of a factor elsewhere.

For this species, the first management concerns would be the confirmation of the vouching collections from the 2002 project. K. Vujnovic (2003) of ANHIC indicated that the specimens would be submitted for an authoritative review, possibly by Prof. H.D. Wilson of Texas A&M University, the contributor for the genus to Kartesz' (1994) synonymy texts. If this is determined to be a rare species, either *Chenopodium leptophyllum* or *Chenopodium dessicatum,* then further surveys should monitor the reported populations and search for further populations in the sandland and dune ridge habitats elsewhere in the reserve.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Chenopodium leptophyllum* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	wind (2), insulation (3)
Flood Hazard	not apply
Soil Drainage	well-drained (3), rapidly drained (2), moderately well drained (4)
Perviousness	rapidly (1), moderately (2)
Site: Macro	not apply
Site: Meso	mid-slope (3), lower slope (4), level (7)
Site: Micro	straight (1)
Site: Surface Shape	concave (2), straight (1)
Ecological Moisture Regime	subxeric (3), submesic (4)
Nutrients	?submesotrophic (2)
Successional Status: 1	young seral (2)
Successional Status: 2	not apply
Disturbance Factors	fire (4)

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	mid- to late July
Phenology: reproductive – inflorescence	early August
Phenology: reproductive – flower	early to mid-August
Phenology: reproductive – fruit	mid-August to early September
Habitat Threats	wind erosion, grazing
Management Considerations	monitoring populations and drought impacts

Photo: *Chenopodium leptophyllum* (narrow-leaved goosefoot)
plant detail: growth habit and inflorescence
(CI1 – Chenlep-020816b – O6, photo Ian D. Macdonald)

APPENDIX 12

Drosera linearis Goldie

—slender-leaved sundew—*DROSERACEAE*

This very small perennial herb species of marly bogs, alkaline wet sites and shores has a provincial Rank of **S2** in Alberta, and a global Rank of **G4** (Vujnovic & Gould 2002, ANHIC 2002). While small, it is very distinctive and easy to identify with its narrow, linear leaves that have reddish, dewy, glandular hairs along the upper leaf surface. Its small white flowers along a raceme, and capsules that hold black oblong seeds. In Alberta it may be mistaken for the related *Drosera anglica* which more often has obovate - linear, rather than linear, leaves, and has seeds which have distinctly attenuate rather than blunt ends.

This species occurs across Canada and the northern states east of the Rocky Mountains, occurring in eight provinces and five of the northern teir of states. It is considered also to be rare in Saskatchewan, Manitoba and Quebec, and in four of the states (NatureServe 2003). Within Alberta it is reported from 19 known locations in the the Rocky Mountain, Parkland and Boreal Natural Regions in the central portion of the province (ANHIC 2003, , Kershaw *et al.* 2001). It was first reported by Fehr (1984), from near Ribstone Creek, just to the west of the present Ecological Reserve boundaries, and within the boundaries by him, and later by Cottonwood Consulting, Ltd. (1986) from several areas in the Great Fen. The Great Fen site was searched diligently several times during the 2002 survey, on 15 and 16 June, 20 and 21 July, and 19 August 2002; however, no plants were rediscovered in the tall thicket fen sites or from the adjacent backshore of the large beaver pond on its southeastern side.

The number of plants of almost 20 years ago from the Great Fen, as reported by Fehr (1984), was given on his specimen label as being "fairly common - here very sparse", while the survey of Cottonwood Consulting, Ltd. (1986) did not indicate any numbers or extent. The 2002 survey did not find the species at all, even though a reasonably intensive survey of the ample potential habitat of the Great Fen area was conducted.

Fehrs's community sample 055 from within the Ecological Reserve was located in the

Great Fen basin, located 1.5 to 3 km northwest of David Lake. He characterized it as being a hummocky depression on rolling sandland with subhygric organic soil that supported a shrubby graminoid fen with a very open low shrub cover of *Betula pumila*, and a semiclosed to semiopen herb layer of mosses, *Betula pumila* suckers, *Salix pedicellaris, Carex diandra, Carex limosa, Menyanthes trifoliata, Equisetum fluviatile, Triglochin maritima, Carex aquatilis, Eriophorum viridi-carinatum, Parnassia palustris* and other fen species. His survey of the occurrence at Ribstone Creek, outside of the Ecological Reserve's boundaries, also described the habitat as being a subhygric organic stream basin supporting a shrubby graminoid fen of semiopen *Betula pumila, Salix canescens* and *Cornus stolonifera*, and semiclosed herb cover in standing water of *Carex aquatilis, Carex utriculata, Eriophorum polystachion* and other fen species. The survey in 2002 examined the general UTM27 locations of Fehr's report, those of Cottonwood Consulting, Ltd. (1986), and Cliff Wallis' precise locations for this and his *Drosera anglica* collection (ANHIC 2002), and their immediate and general vicinities. However, no trace of this species was relocated. Nevertheless, the habitat here still appeared to be entirely suitable for this occurrence of this species, in spite of the effects of the drought in which, at least in the early summer when there was only local surface water evident. Neverhteless, by mid-July there was at least 5 to 12 cm depth of standing water in much of the area. A list of the 86 plant species from this habitat included two notable additions to the Reserve flora which represent considerable range extensions in the province, *Minuartia dawsoniensis* and *Silene menziesii*. Additionally, Wallis' (1990) study of saline wetlands and springs in the Grassland and Parkland Natural Regions listed this species as occurring on higher edges and hummocks of wet saline and subsaline meadows along the lake. While this phrasing appears to have referred to the hummocky seepage habitats of David Lake, it is more likely that he referred to the backshores of the large beaver pond at the southeastern end of the Great Fen where, in 2002, the pond level was considerably drawndown and the backshore habitat appeared to be most unsuitable. Further, the active seepage fen 600 m north of David Lake also was examined, but no populations were discovered there either.

The main and immediate habitat threat to this species probably is the long term impact of the drought conditions within the region, particularly where the critical habitat conditions are related to moisture regime, associated community patterns and browsing use of the site by wildlife. Grazing by cattle appeared to have no effect at this time.

The premier management consideration for this species would be to redetermine the species occurrence within the Great Fen basin. No individuals at all were found during the 2002 survey, but there was ample potential habitat in the tall thicket and shrubby graminoid fen habitats occurring within this basin. There should be a clarification of the report by Wallis (1990) for the species' occurrence along the "lake", so as to include or eliminate the David Lake backshore as a habitat within the reserve. An examination and monitoring of the long-term effects of the drought conditions on the fen habitats could be undertaken.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Drosera linearis* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	frost (4)
Flood Hazard	not apply
Soil Drainage	poorly drained (6), very poorly drained (7)
Perviousness	slowly (3)
Site: Macro	valley floor (6)
Site: Mesolevel (7)	
Site: Micro	straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	subhydric (8), hydric (9)
Nutrients	?submesotrophic (2), ?oligotrophic (1)
Successional Status: 1	young climax (7)
Successional Status: 2	not apply
Disturbance Factors	water related (8)

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	late June; early July
Phenology: reproductive – inflorescence	no information
Phenology: reproductive – flower	early to mid- July
Phenology: reproductive – fruit	no information
Habitat Threats	drainage due to drought
Management Considerations	monitoring populations

APPENDIX 13

Gentiana fremontii Torr.

—marsh gentian—*GENTIANACEAE*

This very short biennial herb of wet calcareous meadows has a provincial Rank of **S2S3** in Alberta, and a global Rank of **G4** (Vujnovic & Gould 2002, ANHIC 2002). This is one of the smallest gentians in the province, reaching only up to 10 cm tall, and is semiprostrate to erect, with opposite, small, scale-like, ovate leaves. It has single small greenish-purple to white flowers at the stem tips, and capsules that flare at their tips. This species differs from the related *Gentiana prostrata* of the Rocky Mountains, in having scarcely recurving, white-margined or scarious leaves (rather than distinctly recurving, green-margined in this species), and a capsule that is sessile (rather than on a distinctly elongated stalk). Young plants may be mistaken for a variety of young herb species, notably members of the *Caryophyllaceae* which also have small, opposite leaves, but thattend not to arise from a small glabrous basal rosette and have separate petals. Indeed, finding this species in its shrubby or meadow habitats is difficult due to its small size. This species has been known as *Gentiana aquatilis auct., non* L., and was treated under *Gentiana prostrata* Haenke *ex* Jacq. var. *americana* Engelmann in the *Flora of Alberta* of Moss (1983).

This species occurs in the western third of North America and also in eastern Asia. In Canada it is rare in the two or the four provinces in which it occurs, Alberta and Saskatchewan, and in the United States it is rare in two of the seven states where it occurs (NatureServe 2003, Kershaw *et al.* 2001). As well, Argus and Pryer (1990) included this species in their list of nationally rare species. In Alberta it has been recorded from ten known locations in the Parkland Natural Region's western portion, with the Wainwright Dunes Ecological Reserve being the only report from its eastern portion (ANHIC 2003). It was first recorded within the reserve by Fehr (1984) from a 1983 collection on the north shore of David Lake, and next by Cottonwood Consultants, Ltd. (1986) who indicated it on the significant features map, and had a 1986 specimen collection by C. Wallis from the vicinity of the peninsula's eastern offshore. Unfortunately, the label reference information is vague or contradictory for both these locations, stating in words the north shore of David Lake, but giving sectional or UTM27 locations removed from the lake or their described habitat (ANHIC 2002). The current survey did discover three general locations for the species, with two sampled locations within the Ecological Reserve's boundaries on the northern and southwestern sides of David Lake's backshore, and two proximate locations east of the Reserve's boundary on the lake's northern backshore.

There is no information on the number of plants in the previously discovered locations for this species, except to indicate that they were "occasional". The current survey discovered a total of at least 329 individual plants in 2002; however, only three plants were at two locations within the Reserve boundaries, and the rest were outside the boundaries. Given the difficulty of seeing this very small species in the thicket and graminoid meadow undergrowth, the populations undoubtedly were under-sampled. In the two locations within the boundaries, only one or two plants were discovered within large sampled polygons that were 15 m X 40 m and 10 m X 30 m. However, it is likely that the number of individual plants is larger, particularly in light of the species location discovered just barely outside the Reserve, where a 15 m X 25 m sample in the habitat enclosed 142 counted plants in 29 clusters, and another sample had 184 plants counted in 24 small clusters in a 10 m X 107 m area. Over the entire 110 m X 500 m area of the tall thicket zone along this portion on the David Lake north backshore, there probably were well over 1 000 plants. The phenology of the plants here had flowering plants in Fehr's collection from late May 1983 and Macdonald's record from mid-July 2002, although these probably represent the extreme begining and end to the flowering period, which normally would be in June. In 2002, fruit were developing prior to early July and probably matured into late July, with well over 20% of the population at mid-fruiting by mid-July, and all seeds matured and shed by mid-August.

Wallis' 1990 study of saline wetland and spring habitats indicated that this is a "facultative wetland species, scarce in saline seepage meadows, most frequent along drier edge in wire rush (*Juncus balticus*) communities". The collection of A. Fehr at the Alberta Parks and Protected Areas herbarium was from a "hummocky *Betula* (*occidentalis*) – *Salix* (?*maccalliana* or ?*pseudomonticola*)" fen which was either associated with the David Lake backshore or was in a depression on the sandlands to the north of the lake. C. Wallis' collection at the University of Alberta herbarium indicated that the habitat was "hummocks and moist meadows (dominated by *Antennaria*, occurring) along the lake". The 2002 survey sampled the hummocky meadows both in the near- and offshore situations along the eastern portion of the David Lake peninsula and the northern side of David Lake, but no populations of this species were recorded. These backshore meadows were dominated by *Deschampsia cespitosa, Juncus balticus, Agropyron trachycaulum, Potentilla anserina, Crepis runcinata,* and others, while the offshore meadows were dominated by *Juncus balticus, Potentilla anserina, Glaux maritima, Agropyron trachycaulum, Deschampsia cespitosa, Puccinellia nuttalliana* and *Hordeum jubatum.* Additionally the well-developed hummocky terrain of the seepage slopes on the peninsula also was searched, but without success. In wetter climatic conditions these sites were hygric with flowing, calcareous surface water. The meadows now, however, supported a much drier complement of species, including the notable carpets of *Antennaria parvifolia* indicated by Wallis, with Juncus balticus, Distichlis stricta, Calamagrostis stricta, Carex scirpoidea, Glaux maritima, several of the calcareous fen species, such as *Primula incana, Lobelia kalmii* (Kalm's lobelia), *Carex aurea, Senecio pauperculus,* and even the rare *Carex parryana.* The hummock terrain was probably formed by the trampling of cattle through the soft soils as part of their grazing pattern; in many instances these hummocks are over 25 cm or 35 cm tall. The *Gentiana fremontii* plants probably would occur on the crests or sides of these hummocks; however, the species was not recorded from these habitats in 2002, probably due to their now very dry moisture regime caused by the prolonged drought conditions. The plants that were discovered during the 2002 survey occurred in two general backshore thicket and shrubby graminoid fen habitats. These sites would have had hygric to subhydric moisture regimes in wetter climates, but the severe regional drought reduced the available ground moisture to subhygric conditions, with no sign of flowing ground water. The shrubby graminoid fen community had an very open to semiopen, medium height shrub complement of *Salix maccalliana, Salix pseudomonticola, Salix petiolaris, Salix planifolia* (flat-leaved willow), *Betula occidentalis, Populus balsamifera* saplings and *Salix candida,* and a semiclosed herb cover of *Carex lanuginosa, Carex aurea, Calamagrostis stricta, Juncus balticus, Deschampsia cespitosa, Potentilla anserina, Carex aquatilis, Festuca ?trachyphylla* (tall red fescue), *Solidago canadensis* (Canada goldenrod) and several species associated with the alkaline seepage sites, such as *Carex capillaris* subsp. *chlorostachys, Eleocharis quinqueflora, Parnassia palustris, Primula incana, Senecio* *pauperculus, Lobelia kalmii, Crepis runcinata, Juncus longifolius, Dodecatheon pulchellum, Gentiana crinita, Gentianella amarella* and others, including the rare *Lycopus americanus* and *Carex crawei*. The tall thicket community on the lake's northern backshore habitat presented a semiopen tall shrub cover of *Salix maccalliana, Betula occidentalis* and *Populus balsamifera* saplings, a semiopen lower shrub cover that included the above tall shrub species and *Salix petiolaris* and *Salix pseudomonticola*, and a semiclosed to closed herb cover of *Deschampsia cespitosa, Juncus balticus, Potentilla anserina, Carex aurea, Carex scirpoidea, Carex capillaris* and many of the calcareous seepage slope species indicated above, but with a more sparse presence. It is likely that this tall thicket community on the lake's northern backshore originally extended eastward from the reserve's eastern boundary onto the now open shrubby graminoid meadow that had the much larger population of *Gentiana fremontii*. A conversation with the rancher who has been stewarding the area indicated that this area had been cleared of growth in the past ten years, and that the more open shrubby growth had developed since then (Maull 2002).

The major habitat threat to the species in the Reserve is associated with the long-term regional drought conditions that have caused a considerable drawdown of the lake's water level, resulting in a notable lowering of the water table and change in the moisture regime from subhydric to subhygric. As well, the surface water seepage from the springs that previously was prevalent, had virtually ceased. The effect on the habitats has been enough to encourage the species cover values to change, more mesic species to invade, and the species to be exposed to more extreme temperature changes. The clearing of the potential habitats along the northern shore of David Lake may have had both desirable and undesirable effects on the populations. It is apparent that the known population in the cleared area now has quite an impressive size, perhaps due to the 'releasing' effects of opening the canopy. However, such clearing also may have eliminated other features. Actual grazing in the habitats did not appear to have had direct effects on the populations of this rare plant; its small size certainly does not expose it to aggressive selection for forage.

Management considerations here must involve monitoring the known species locations, both within and beyond the immediate Reserve boundaries, resurveying the formerly reported hummocky meadow sites when the drought conditions decline, determining the actual impact of the drought on the species' survival, and evaluating the impact of the clearing procedures on the lake's northern backshore thicket habitat for the species.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Gentiana fremontii* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	not applicable (1)
Flood Hazard	not apply
Soil Drainage	imperfectly drained (5), poodly drained
Perviousness	moderately (2)
Site: Macro	not apply
Site: Meso	level (7)
Site: Micro	hummocky (2), straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	hygric (7), subhydric (8)
Nutrients	?permesotrophic (4), mesotrophic (3)
Successional Status: 1	?young edaphic (6)
Successional Status: 2	not apply
Disturbance Factors	water (8), site imrpovement (7)

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	mid- to late May
Phenology: reproductive – inflorescence	mid-May to mid-July
Phenology: reproductive – flower	late May, to mid-July
Phenology: reproductive – fruit	late June, to early, mid- to late July
Habitat Threats	drought drawdown of lake; habitat clearing; grazing
Management Considerations	monitoring populations; drought impact

Photo: *Gentiana fremontii*

plant detail: growth habit at mid-flower

(Gf8 – Gentfre-020711a – E7, photo Ian D. Macdonald)

APPENDIX 14

Asclepias ovalifolia Dcne.

—low milkweed—*ASCLEPIADACEAE*

This medium height herb species of open woods, sloped and moist prairies has a provincial Rank of **S3W** in Alberta and a global rank **G5?**, and currently is on the watch list for the province (Vujnovic & Gould 2002; ANHIC 2002, 2003). It is a perennial broad-leaved milkweed which differs from the more common *Asclepias speciosa* (showy milkweed) in having somewhat pubescent, oval-shaped to lanceolate, opposite leaves that are pointed at the tip, but tapered at their base (rather than cordate or rounded), fruit pods that are smooth (rather than having soft tubercles on the surface), flowers that are greenish-white (rather than pink or purplish), and are somewhat smaller in overall size. Additionally, it differs from the provincially rare *Asclepias viridiflora* (green milkweed) which is similar in also having greenish flowers and smooth fruits, but often has additional subterminal inflorescences, cordate leaf bases and no 'horn' structure within the flowers (Moss 1983, Scoggan 1979, Gleason & Cronquist 1991).

This species occurs in the central to west central portions of North America, in five provinces between British Columbia and Ontario, and in ten states along the northern tier of central and midwestern United States. It is rare and possibly extirpated from Ontario, and is rare in five states and is on the provincial Watch list in Alberta (NatureServe 2003, Vujnovic & Gould 2002). In Alberta, it has 26 known locations which occur within the Parkland Natural Region with several in the southern portion of the Boreal Forest Natural Region (Kershaw *et al.* 2001, ANHIC 2003). Several localities within 25 km of the Reserve have been reported (ANHIC 2002). The first reports for this species within the Wainwright Dunes Ecological Reserve were by Bradley & Bradley (1977) and Fehr (1984), but no species locations were given. Cottonwood Consulting, Ltd. (1986) next reported it from the sandlands to the northwest of the Great Fen pond. This report was reiterated in the management plan for the Ecological Reserve (Anon 1998). During the survey in 2002, an additional sixteen species locations were discovered in four general clusters: two west and one north of David Lake, five northwest and eight north northwest of the Great Fen pond.

The size of the species locations in the Ecological Reserve varied from 1 m X 6 m to 25 m X 40 m, and their numbers from 4 plants to 444 plants. Throughout the Reserve, the total accumulative number of plants was counted as 1 317 plants in 16 the recently sampled locations. In the 2002 survey, their development appeared to have their leaves mostly expanded by mid-June, their inflorescences developed by late June to early July, their flowers mostly at anthesis by early to mid-July and possibly to late July, and fruit development probably normally proceeding between mid- to late July and early to mid-August. However, due to the drought conditions and extreme heat during July 2002, the flowers generally experienced considerable dessication, and essentially had their development toward fruit production arrested by late July. Indeed, none of the species locations investigated during the mid- and late summer of 2002 had any but the most rudimentary fruit development, and in several cases, many flowering inflorescences were abscising from the plant stem by the end of mid-July.

The habitats of its populations most often occurred along the southwest-facing, uppermost slopes and crests of the low sand ridges that supported submesic to subxeric native grasslands that were adjacent to backslope aspen groves and their marginal zones of successional open thickets of *Prunus virginiana* and *Populus tremuloides* saplings. The associated herb cover included *Bouteloua gracilis, Calamovilfa longifolia, Selaginella densa, Koeleria macrantha, Agropyron trachycaulum, Stipa curtiseta, Thermopsis rhombifolia* (golden bean), *Carex pensylvanica* and others. In several instances they also occupied openings in young to subintermediate-aged mesic aspen groves and forests in association with *Selaginella densa, Bouteloua gracilis, Calamovilfa longifolia, Carex pensylvanica, Oryzopsis pungens, Solidago missouriensis, Thermopsis rhombifolia, Schizachne purpurascens, Aster laevis* (smooth aster), *Smilacina stellata* and others.

There do not appear to be any immediate habitat threats to this species within the Ecological Reserve. Wildlife browsing by deer and moose was very minimal, with only two plants recorded as having been nibbled at one location. Trampling along ungulate trails has a potential impact of the plants but was not actually observed during the 2002 survey, and cattle grazing was not evident in the portions of the Reserve where the plant populations occurred.

Management considerations for this species would be limited to monitoring the species' populations and cattle grazing patterns in their habitats, and limiting hiking along the convenient ungulate trails. The succession of an aspen grove cover over the habitats in the future may well shade out the species. Burning in the habitats may affect the above-ground plant parts, although the rhizomes probably would persist to further the survival of the plants at their locations.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Asclepias ovalifolia* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION	
Exposure Type (88 89)	not apply
Flood Hazard (90)	not apply
Soil Drainage (91)	rapidly drained (2), well drained (3)
Perviousness (92)	rapidly (1), moderately (2)
Site: Macro (93)	plain (7)
Site: Meso (94)	crest (1), upper slope (2), lower slope (4)
Site: Micro (95)	straight (1)
Site: Surface Shape (96)	convex (3), concave (2)
Ecological Moisture Regime (97)	subxeric (3), mesic (5), submesic (4)
Nutrients (98)	?submesotrophic (2)
Successional Status: 1 (99)	young seral (2)
Successional Status: 2 (101)	not apply
Disturbance Factors (102-106)	fire (4)

ANHIC RARE NATIVE PLANT REPORT	
Phenology: vegetative	mid-June
Phenology: reproductive – inflorescence	mid- to late June, early July
Phenology: reproductive – flower	early to mid- to late July
Phenology: reproductive – fruit	late July, early August
Habitat Threats	trampling, grazing, fire
Management Considerations	monitoring populations, limiting access

Photo: *Asclepias ovalifolia* (low milkweed)
plant detail with flowering inflorescence
(Ao7—Asclova-020714b - E22, photo Ian D. Macdonald)

APPENDIX 15

Lycopus americanus Muhl. *ex* W.C. Barton — American water-horehound—*LAMIACEAE*

This perennial, low herb species of marshy sites and moist stream sides has a provincial Rank of **S2** in Alberta, and a global Rank of **G5** (Vujnovic & Gould 2002, Kershaw *et al.* 2001, ANHIC 2002). It is an erect, deciduous plant with long rhizomes and stolons, growing in the ecological reserve to about 42 cm tall. It has opposite, deeply toothed, laciniate to pinnate, short hirsute leaves with distinct petioles. The inflorescence has very small, clusters of white, five-petalled flowers in each of the leaf axils, with narrowly triangular sepals that are over twice as long as wide at their base and are up to 2 mm long. The fruits are nutlets that are 1.0 - 1.4 mm wide X 0.7 - 1.0 mm long that form groups of four with a depressed center. This is one of the larger members of this genus in the province. It may be readily differentiated from the common *Lycopus asper* which has leaves that are merely toothed and are bluntly sessile, and has nutlets that are larger, mostly 1.6 - 2.1 mm wide X 1.4 - 1.8 mm long, and bears tubers at the stem base. As well, the common but smaller *Lycopus uniflorus* that has toothed leaves that taper to short petioles and are essentially glabrous, broadly triangular sepals which are less than twice as long as wide at their base and under 1 mm in length, and are shorter than the nutlets. Additionally, it may be distinguished from the more eastern *Lycopus virginicus* which has four petals, and from the European *Lycopus europaeus* which has longer and stiffer hairs on the lower leaf surface and anthers longer than 0.5 mm, neither of which have been reported in Alberta (Moss 1983, Gleason & Cronquist 1991, Scoggan 1979).

This species occurs across virtually all of North America south of the 60° latitude, with the exception of Nevada and Labrador, and is considered to be rare in Canada in the provinces of Alberta and Newfoundland, and in the United States in two southeastern states (NatureServe 2003, Kershaw *et al.* 2001,). Within the province it is known from 14 widely spaced known locations in the Grassland and Parkland Natural Regions, with at least one other station in the Wainwright area (ANHIC 2003). The biophysical studies of the Ecological Reserve and its immediate vicinity by Bradley & Bradley (1977), Fehr (1984) and Cottonwood Consultants, Ltd. (1986) presented the initial reports of the species occurrence here, with at least three locations, and the 2002 survey discovered an additional 17 locations, for a total of 20. Four of these sampled sites were located around the northern, western and southwestern backshores of the David Lake basin, five to the southeast of the Great Fen pond, three to the northeast of the Great Fen, two in a spring fen north of David Lake, and one outside the eastern boundary of the Reserve north of the lake.

The total population of the species at the various locations within the Reserve is 887 individual plants, with and additional 15 being mere metres outside its eastern boundary. The previous records did not give accurate population sizes, except to indicate that they were "uncommon – here sparse". The populations occurred in areas from 1 m X 3 m to 10 m X 60 m, and in all probability they also extended around the northern shore of David Lake in a 100 m X 500 m area. The sampled numbers of individuals in the populations ranged from single plants to over 90 plants, and along the David Lake northern backshore there possibly are over 3 000 plants, based on 25 m X 25 m and 15 m X 30 m samples within the area. The phenology of the plants in the Reserve in 2002 had the leaves in young development stage by mid- to late June, and at least half developed by early July. The inflorescences were developing in the leaf axils by early to mid-July, and the flowers were appearing over a two month period between early- to late July and into mid- or late August. The nutlet development also was continuous between mid- to late July, to early to mid- to late August, and into early September.

Wallis' study of saline wetlands and springs (1990) described this as being an "obligate wetland species, very local in springs ...". The species occupied three different wetland and lowland habitats within the Reserve. Potentially the largest populations occupy the tall thicket communities of the backshore around David Lake. Along its northern backshore was a subhygric tall thicket of semiclosed *Betula occidentalis, Salix maccalliana, Salix planifolia, Salix pseudomonticola, Cornus stolonifera, Juncus balticus, Crepis runcinata, Solidago canadensis, Deschampsia cespitosa, Carex viridula, Carex aurea, Glyceria striata, Senecio pauperculus, Rubus pubescens* and others. Also associated with this habitat were several of the calcareous seepage species, such as *Parnassia palustris, Lobelia kalmii, Primula incana,* and the rare *Gentiana fremontii* and

Carex crawei. It is in this extensive habitat that there is the potential for over 3,000 plants to occur. At the southwestern backshore of the lake the species occurred in much sparser numbers in a subhygric semiopen low thicket of *Salix lutea* (yellow willow), *Salix serissima* (autumn willow), *Salix candida* (hoary willow), *Calamagrostis stricta, Carex aurea, Juncus balticus, Solidago canadensis* and several of the calcareous seepage species, including the rare *Gentiana fremontii*. Additionally,a modest number of plants of the species was supported in a tall thicket habitat that formed a fringe around a wetland basin 600 m to the north of David Lake, that also was dominated by *Betula occidentalis, Salix pseudomonticola, Salix sericea* and *Carex aquatilis*, with many swamp forest species. Fehr's community sample 043 probably was this same community, but his survey captured it in a non-drought situation, with standing water and a greater variety of marshland sedges, such as *Carex aquatilis, Carex lasiocarpa* (probably actually Carex lanuginosa) and *Carex utriculata* being evident. This thicket community also occurred along the lake's northern side, but to the east of the Reserve boundary, no plants of this species were located there. A variation of this thicket community occurring in a subhygric basin in the sand plain which was well-removed from the lake's northern backshore, did support a small population. Fehr (1984) also described a second habitat complex for this species as an open shrubby marsh on the western side of David Lake, also with high water in evidence. His community sample 045 described the species from very scattered *Salix* (species) and *Salix candida* in a graminoid marsh of *Carex aquatilis, Carex lasiocarpa* (?), *Carex utriculata, Carex sartwellii* (Sartwell's sedge), *Calamagrostis inexpansa, Scirpus acutus* (great bulrush), *Juncus balticus* and others. The third major habitat complex in the Reserve was associated with the beaver dams and shorelines of the drawndown beaver ponds, such as those at the southeastern and to the northeast ends of the Great Fen. The dams had a subhygric, sandy and organic substrate and supported an essentially mixed graminoid marsh fringe community of *Scirpus microcarpus* var. *rubrotinctus* (small-fruited bulrush), *Calamagrostis canadensis, Carex aquatilis, Carex utriculata, Mentha arvensis* (wild mint), *Lysimachia thyrsiflora* (tufted loosestrife), *Eleocharis palustris, Lysimachia ciliata, Sonchus uliginosus, Rumex occidentalis* (western dock), *Glyceria striata, Potentilla norvegica* (rough cinquefoil) and others. These dams appear to have been used as wildlife trails for crossing the ponds, and some degree of disturbance from the trampling may have created successional conditions here. Also associated with the pond drawdown and supporting plants of this species were shoreline marsh meadows of *Calamagrostis canadensis, Glyceria grandis, Poa palustris* (fowl blue grass), *Carex utriculata, Eleocharis palustris, Juncus nodosus, Alopecuris aequalis* (short-awned foxtail), *Juncus balticus, Catabrosa aquatica* (brook grass) and others. The final habitat that the species was discovered in was an active calcareous seepage slope with a shrubby graminoid fen, 600 m to the north of David Lake, where the plants grew at the base of the shrubs. This hygric site with flowing water had scattered *Betula occidentalis* over a marsh meadow of *Carex utriculata, Carex viridula, Carex aurea, Eleocharis quinqueflora, Solidago canadensis, Gentiana crinita* and several of the typical fen species.

Habitat threats in the Reserve for this species were related to the prolonged drought conditions, in particular as they affected the water levels of the pond, stream and lake shoreline habitats. The effect may be variable in the case of the stream and pond banks, where there still may have been sufficient moisture in the soil to allow the species and associated shoreline communities to expand into the wetland basin, as was the case in the stream / pond system to the northeast of the Great Fen. However, on the other hand, the drawdown conditions in other instances have not produced suitable habitat, at least at this time, as is the case in the large pond to the southeast of the Great Fen. Additionally, the use of the beaver dams as game trails may have lead to inadvertent trampling as well as incidental browsing of the plants, as was observed at one site.

Management considerations for this species should include monitoring the known populations and searching elsewhere around the periphery of the David Lake basin and the Great Fen and the other wetland shrubby marsh and thicket communities in the Ecological Reserve. The impact of prolonged drought conditions on the beaver populations also should be examined, since the loss of the beaver dams and associated activities may change the abundance of suitable habitat for this and several other rare vascular plant species, such as the reported *Najas flexilis, Elodea biflora* and *Ruppia cirrhosa.*

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Lycopus americanus* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	frost (4)
Flood Hazard	not apply
Soil Drainage	imperfectly drained (5), poodly drained (6)
Perviousness	moderately (2)
Site: Macro	not apply
Site: Meso	depression (6), level (7)
Site: Micro	irregular (5), straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	hygric (7), subhygric (5), subhydric (8)
Nutrients	?mesotrophic (3)
Successional Status: 1	young seral (2)
Successional Status: 2	not apply
Disturbance Factors	water (8)

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	mid- to late June to early July
Phenology: reproductive – inflorescence	early to mid-July
Phenology: reproductive – flower	early to mid- to late July, to mid- to late August
Phenology: reproductive – fruit	mid- to late July, to early to mid to late August to early September
Habitat Threats	drought drawdown of pond / stream / lake; game trails
Management Considerations	monitoring populations; drought impact on beaver populations

Photo: *Lycopus americanus* (American water-horehound)
detail of plant growth habit
(La17—Lycoame-020719d - J2, photo Ian D. Macdonald)

APPENDIX 16

Veronica catenata Pennell.

— water speedwell—_SCROPHULARIACEAE_

This perennial procumbent low herb of a variety of lowland sites has a provincial Rank of **S2S3** in Alberta, and a global Rank of **G5** (Vujnovic & Gould 2002, ANHIC 2002). This is one of the three native species of *Veronica* occurring in Alberta that have somewhat open racemes which arise from the leaf axils and have strictly glabrous leaves that are more than three times as long as wide. It may be distinguished by its sessile leaves from *Veronica americana* (which has petioled leaves), and by the clasping bases of the leaves from *Veronica scutellata* (which has merely sessile leaf bases). Additionally it differs from the non-native *Veronica anagallis-aquatica*, with which it may be confused, but which previously has not been reported in Alberta, by its shorter leaves that are less than three times as long as wide, and has pedicels that are strongly ascending or upcurved (Scoggan 1979). This species includes *Veronica comosa* Richt. var. *glaberrima* (Pennell) Boivin and *Veronica salina auct. non*. However, it is not recorded under any of the above synonyms in the NatureServe data base of 2003.

It occurs across North America in virtually all the provinces and states, and is rare in Alberta and in 3 states (Kershaw *et al.* 2001). It has been mapped in Alberta from west of Calgary in the Grassland Natural Region (Kershaw *et al.* 2001), and has 21 known locations in the province (ANHIC 2003) but apparently with no records reported in the Parkland Natural Region (ANHIC 2002). The record of its occurrence in the vicinity of Wainwright Dunes Ecological Reserve was presented in the biophysical study of the reserve and its general vicinity by L. and C. Bradley (1977) that was reported in the species list in Fehr's (1984) inventory of the general area. However, no information was available for the location or number of individuals, and Fehr himself apparently did not observe the species, so it was not his community sample data. As well, this species was not repeated in the study of Cottonwood Consulting, Ltd. (1986) nor in the accumulative list in the Reserve's management plan (Anon 1998), hence its presence already may have been discounted with the authorative editing for that report. The species was not observed during the 2002 survey, hence there is no recent location information available.

The habitat of this species in the province appears to be quite diverse, including marshy, muddy or gravelly ground and shallow water by ponds and streams, and in ditches (Kershaw *et al.* 2001, Moss 1983). The reported habitat of the Bradley's in Fehr (1984) was "wet area near beaver lodge". If the species actually occurs within the Reserve's boundaries, the only beaver lodge recorded still existing was in the large pond at the southeastern side of the Great Fen area, 1.3 km northwest of David Lake, at about 52°35.660'N / 110°37.975'W. This habitat was surveyed for this species in 2002, but none was found. The drawdown conditions of the pond shoreline habitats may have both altered and eliminated some former and potential habitat sites, but also created newer successional sites for the species.

Any habitat threats for this species would be associated with the drawdown conditions of any wetland shores where it might occur that are caused by the prolonged drought or by cessation of beaver activity. Additionally, there may be impacts from trampling or browsing by wildlife or cattle.

The first management concern for this species would be to find any vouching records for this species within the Reserve boundaries. No collection could be located by the author in the Alberta Parks and Protected Areas or University of Calgary herbaria, and the other herbaria (Alberta Provincial Museum, University of Alberta,) could not be examined for this species. Any potential occurrence of the species recorded by the author during the survey of the study area was determined to be the common *Veronica americana*. Any discoveries of records or existing populations should be resurveyed and monitored.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Veronica catenata* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION (probably characteristics)	
Exposure Type	frost (4)
Flood Hazard	may be expected (4)
Soil Drainage	imperfectly drained (5), poorly drained (6)
Perviousness	moderately (2)
Site: Macro	not apply
Site: Meso	depression (6), level (7)
Site: Micro	irregular (5), straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	hygric (7), subhygric (5), subhydric (8)
Nutrients	?mesotrophic (3)
Successional Status: 1	young seral (2)
Successional Status: 2	not apply
Disturbance Factors	water (8)

ANHIC RARE NATIVE PLANT REPORT	
Phenology: vegetative	no information (?mid- to late June to early July)
Phenology: reproductive - inflorescence	no information (?late June to early September)
Phenology: reproductive - flower	no information (?late June to early September)
Phenology: reproductive - fruit	no information (?early to mid- to late July, to early September)
Habitat Threats	drought drawdown of pond habitat
Management Considerations	rediscover and monitoring populations

APPENDIX 17

Hedyotis longifolia (Gaertn.) Hook.

— long-leaved bluets—*RUBIACEAE*

This low perennial herb of sandy soil in open woods, dunes and grassland habitats has a provincial Rank of **S2** in Alberta, and a global Rank of **G4G5** (Vujnovic & Gould 2002, ANHIC 2002). It has loosely tufted stems that are 10 cm to 25 cm tall, with small, linear, opposite, sessile leaves with purplish stipules. The inflorescence is terminal cymes of white, pink or light blue flowers that have four spreading lobes and a long tube and narrow sepals, and the fruit is a capsule. It also has been called *Houstonia longifolia* Gaertn. The only other member of this genus in Canada that has similar leaf and inflorescence is *Hedyotis canadensis*, an eastern species that does not enter the prairie provinces, and the other similar member in the northern United States, *Hedyotis nigricans*, does not extend further west than the Great Lakes. It bears a passing resemblance to several species of the genera *Cerastium* and *Stellaria*, but they differ in having separate petals, rather than petals joined at their base (Moss 1983, Gleason & Cronquist 1991).

The species occurs in the eastern half of North America from the southern part of western Canada to the Maritimes in five provinces, and southward in 35 states from east central United States to its east coast (NatureServe 2003). It is rare in Alberta, Saskatchewan and Quebec, and in five states, and indeed, is considered to have been extirpated from two states (NatureServe 2003, Kershaw *et al.* 2001). In Alberta it has 15 known locations from the Parkland and southern Boreal Natural Regions, with several in the vicinity of Wainwright (ANHIC 2003, Kershaw *et al.* 2001). It was reported from the Wainwright Dunes Ecological Reserve by Cottonwood Consulting, Ltd. (1986) where it was indicated on the sensitive features map as occurring in a sandland aspen grove complex northwest of David Lake. The area was inspected during the 2002 project, but no plants were recorded, perhaps due to the drought conditions, and no population size was indicated in the original source.

The general area where the species was reported from is an aspen successional forest and grove complex. Fehr (1984) did not have a community sample from this area, but the associated vegetation was a semiopen, low tree cover of *Populus tremuloides*, with open tall shrub cover of aspen saplings, *Salix bebbiana*, *Prunus virginiana* and *Elaeagnus commutata*, a semiclosed low shrub cover of *Rosa acicularis*, *Prunus virginiana*, *Spiraea alba* and *Juniperus communis* (common juniper), and a semiclosed herb cover of *Carex siccata*, *Oryzopsis asperifolia*, *Oryzopsis pungens*, *Galium boreale*, *Smilacina stellata*, *Thermopsis rhombifolia*, *Fragaria virginiana*, and others.

Habitat threats at this time may be the prolonged drought conditions in the habitat that may have arrested the development of the plants. Fire probably greatly affected this site in the past but recent burning signs were not evident. Grazing was not evident in this portion of the Reserve, and the species is small enough as not to be a favoured grazing species.

Management considerations should include a mid-summer resurvey of this aspen grove for the occcurrence of this species under moister climatic conditions. The impacts of fire and continued cattle grazing management in the area should be evaluated prior to any future burns or increase in grazing pressures.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Hedyotis longifolia* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION	
Exposure Type	not apply
Flood Hazard	not apply
Soil Drainage	well drained (3)
Perviousness	moderately (2)
Site: Macro	plain (7)
Site: Meso	depression (6)
Site: Micro	straight (1)
Site: Surface Shape	concave (2)
Ecological Moisture Regime	submesic (4)
Nutrients	?submesotrophic (2)
Successional Status: 1	young seral (2)
Successional Status: 2	not apply
Disturbance Factors	fire (4)

ANHIC RARE NATIVE PLANT REPORT	
Phenology: vegetative	no information
Phenology: reproductive - inflorescence	no information (June to July)
Phenology: reproductive - flower	no information (July?)
Phenology: reproductive - fruit	no information (August?)
Habitat Threats	trampling, grazing, fire
Management Considerations	monitoring populations, limiting access

APPENDIX 18

Aster pauciflorus Nutt.

— few-flowered aster—*ASTERACEAE*

This low, late-flowering herb of alkaline flats has a provincial Rank of **S2** in Alberta and global rank of **G4** (Vujnovic & Gould 2002, ANHIC 2002). This species also is known as *Almutaster pauciflorus* (Nutt.) A. & D. Love (marsh alkali aster) (NatureServe 2003). It may be differentiated from the several asters of similar habitats in the study area, notably *Aster ericoides, Aster borealis* (marsh aster) and *Aster brachyactis* (rayless aster), by its narrow, somewhat leathery leaves that are not auriculate and reduce in size upwards along the stem to resemble bracts, its stem which often is procumbent and is increasingly glandular into the inflorescence and flower bracts, its rather loose and unequal three-tiered involucral bracts, and its white to bluish ray flowers (Moss 1983, Scoggan 1979, Gleason & Cronquist 1991).

This species occurs in west central North America, in Canada from the Northwest Territories to Manitoba, and in the southwestern third of the United States through Wyoming and the Dakotas. It is rare in Alberta and in two of the northern states (NatureServe 2003, Kershaw *et al.* 2001). It has 28 known locations in Alberta, in the vicinity of Red Deer, Medicine Hat and Wainwright (Kershaw *et al.* 2001, ANHIC 2003), and Wallis (1990) listed it from eleven areas in his survey of saline wetlands and springs in southeastern Alberta. It was first reported by Wallis (1990) from the north side of David Lake, apparently east of the base of the peninsula, and was next located by Miejer (2001), also offshore from the base of the peninsula. An additional eight locations were discovered during the current survey within the Wainwright Dunes Ecological Reserve boundaries to the northeast and east of the David Lake peninsula as a mixture of isolated small clusters, and south of the peninsula as a much larger population. As well, outside the Ecological Reserve boundaries along the eastern offshore of David Lake, there was a notably large population that probably extended well to the southwest along the offshore. Additionally, it is likely that there are other populations around the David Lake basin, particularly on its western side within the ecological reserve boundaries, and on the southeastern and southern sides outside the boundaries.

Investigation of the calcareous springs to the north of David Lake and around the Great Fen did not reveal additional populations.

A total of 551 individual plants of this species were counted in seven localities within the boundaries of the Ecological Reserve, all along the north side of David Lake and along the eastern side of its peninsula, while outside of the Reserve 6 000 were estimated along the lake basin's eastern side, and in all likelihood, the total number of plants from around the lake's entire shore may well approach 10 000. The eight locations on the northeastern and eastern sides of the David Lake peninsula supported single to a dozen plants, and larger population off the southern tip of the peninsula had over 500 plants in a 45 m X 110 m area. In the Reserve in 2002, the species developed its inflorescence in early August, and came into flower between mid-to late August and probably to mid-September, with only a few flowers expanding on any one day. Indeed, the petals did not open until the late morning, so that any early morning observations may have overlooked the presence of these star-like flowers. It produced fruit from late August to mid- or late September.

Wallis' 1990 study of saline wetlands and springs in the Grassland and Parkland Natural Regions of Alberta recorded the species generally as being rare to locally common in springs, wet meadow outflows from springs and lake backshores. At Reflex (Old Salt) Lake to the southeast of Chauvin, east of the reserve, he recorded it as occurring "along the lakeshore of a hypersaline lake with sandy and generally saline shore", with associated species there and elsewhere including *Muhlenbergia asperifolia, Carex parryana* and *Gentiana aquatilis* (*i.e., fremontii*), as generally is the case with its species locations here. The most notable habitat for the species was the drawdown offshore barrens of the David Lake basin with its very open, exposed alkaline sand, having over 10% cover of *Glaux maritima, Scirpus pungens, Juncus balticus, Muhlenbergia asperifolia, Potentilla anserina,* and *Agropyron trachycaulum* subsp. *trachycaulum* and subsp. *subsecundum.* This habitat supported the larger populations in the David Lake basin, and included vast populations of *Muhlenbergia asperifolia.* Also supporting smaller and more discrete locations for this species that were were the offshore meadows that extended from the high water level line for about 150 m into the David Lake basin. These tended to have a semiclosed cover consisting of the above associated species that occurred among the hummocky terrain caused by long-term cattle trampling while grazing in the offshore meadows, and probably is the habitat referred to by Meijer (2001). A less common habitat in the study area was the semiopen shrubby meadow along the northern backshore of David Lake where there may have been some groundwater seepage influence. Here the cover was low shrubs of *Salix petiolaris* and *Betula occidentalis* and a more closed herb cover of *Juncus balticus, Potentilla anserina, Carex scirpoidea, Agropyron trachycaulum* subsp. *subsecundum* and others.

The potential for habitat threats to the populations here must inextricably be linked to the fluctuation of the water level of David Lake, particularly since virtually all the species locations were concentrated in the currently submesic, drawdown zone between about 20 m and 100 m offshore from the former high water level line. A return to the high water levels of previous years, however welcome for the other rare species such as *Ruppia cirrhosa*, would probably greatly reduce the extent of the populations of this species and the rare *Muhlenbergia asperifolia* and *Carex parryana*. Grazing did not appear to present an immediate threat to the populations except as an incidental impact from trampling and occasional browsing. The cattle tended to gravitate to the comparatively more lushly developing *Hordeum jubatum*-dominated graminoid cover of the offshore and did not dwell in the short and sparse meadows and barrens. It was observed, however, that grazing in the denser offshore *Juncus balticus* swards may at least locally have removed the shading of the graminoid cover and apparently 'released' the plants.

Management considerations should include monitoring the current populations to ascertain how well they are surviving the drought conditions and prolonged drawdown of the alkaline lake bed. It is likely that when the drought ends and the lake level rises, the population will be greatly reduced and probably will be restricted to its currently more marginal habitats; However, undoubtedly, the rhizome, and possibly also the seed banks, will persist to take advantage of another drawdown period. The impact of grazing also could be examined, although as noted above, at this time it did not appear to be significantly detrimental.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Aster pauciflorus* in the Wainwright Dunes Ecological Reserve

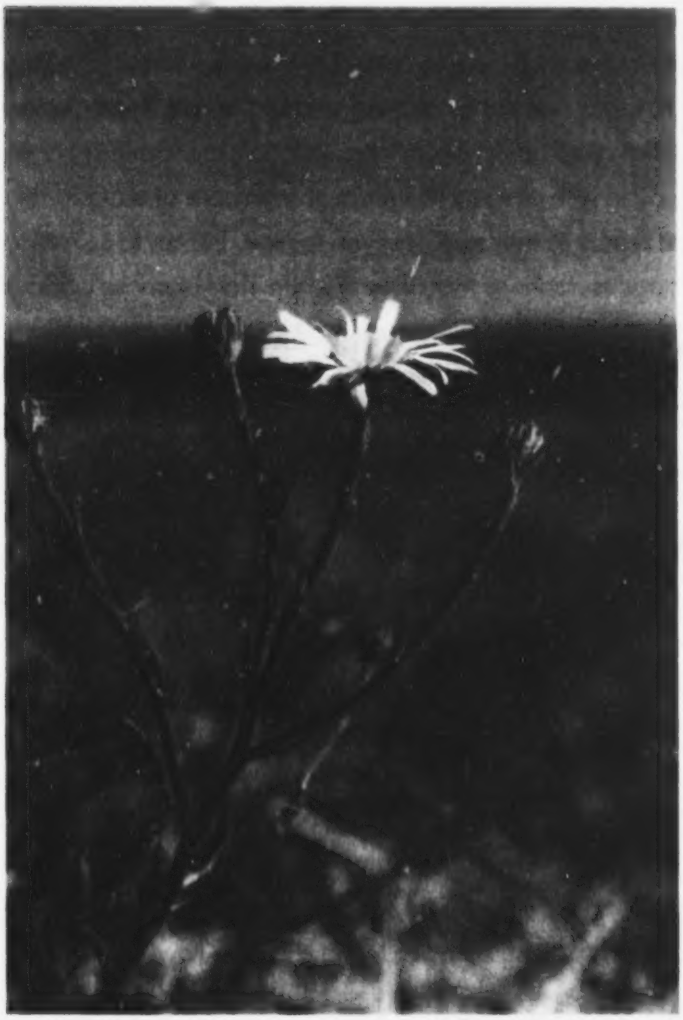
ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	not apply
Flood Hazard	may be expected (3)
Soil Drainage	poorly drained (6), imperfectly drained (5), moderately well drained (4)
Perviousness	slowly (3), moderately (2)
Site: Macro	plain (7), valley floor (6)
Site: Meso	level (7), depression (6)
Site: Micro	straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	hygric (7), subhygric (6)
Nutrients	?hypereutrophic (6)
Successional Status: 1	young seral (2)
Successional Status: 2	pioneer (1)
Disturbance Factors	water related (8)

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	mid- to late July, early to mid-August
Phenology: reproductive	early to mid- to late August
Phenology: reproductive - flower	mid- to late August, early September
Phenology: reproductive - fruit	late August, early to late September
Habitat Threats	flooding, grazing
Management Considerations	monitoring populations, limiting access

Photo: *Aster pauciflorus* (few-flowered aster)
plant detail: inflorescence and flower
(Ap3—Astepau-020815a - O23, photo Ian D. Macdonald)



APPENDIX 19

Shinnersoseris rostrata (A. Gray) S. Tomb

—annual skeletonweed—*ASTERACEAE*

This annual, low herb of sandy bank, dunes and loose sand habitats has a provincial Rank of **S2** in Alberta, and a global Rank of **G5?** (Vujnovic & Gould 2002, ANHIC 2002). *Shinneroseris rostrata* has erect, slightly branching stems, which in the Reserve grow to a height of about 25 cm. It has slightly arching and soft, linear, three-veined, sessile, glaucous leaves that are 5 cm to 20 cm long. Its inflorescence forms a relatively flat-topped, open panicle with pink ray flowers in an involucre of a cluster of very small, acuminate-ovate bracts at the base of seven to nine, 10 mm to 16 mm long, linear bracts, and it produces achenes that have a white, non-plumose pappus. This species was formerly called *Lygodesmia rostrata* A. Gray, and its nearest relative is another member of that genus, *Lygodesmia juncea* (Pursh) D. Don (skeletonweed), which invariably occurred with this species, and may be somewhat similar on first viewing (Moss 1983, Scoggan 1979). However, the *Lygodesmia juncea* differed in being a much more sprawling plant, growing as a perennial by a rhizome, with stiff, straight to only slightly arching, subulate (awl-shaped) leaves that also are glaucous but rarely attain 5 cm in length, a more diffuse inflorescence that frequently is not a well-defined panicle, with an involucre of small basal bracts that are more narrowly acute, and with only five linear larger bracts, and a sap that is notably yellow rather than white. Another provincially rare, pink-flowered, paniculate, erect plant with which it may be confused is *Stephanomeria runcinata*, which is limited to the Grassland Natural Region in the province. It differs in being a perennial, having backward-pointing teeth on the leaves, and having a distinctly plumose pappus atop the achene. As well, drought-stressed, stunted plants of the more common *Lactuca pulchella* could be mistaken for the species, but differed from these by typically having blue flowers with an even gradation in bract sizes in the involucre. In seeking these plants in their habitat, their presence also frequently was obscured due to their resemblance to the glaucous leaf colour and similar leaf projection angles and lengths of the common sand dune grass, *Calamovilfa longifolia*; so a careful examination in their potential habitat is warranted.

The species occurs in central western North America from the southern parts of the prairie provinces southward toward Texas and into Mexico. It is rare in Alberta, Saskatchewan and Manitoba, and three of the northern midwestern states (NatureServe 2003, Kershaw *et al.* 2001). In Alberta it has 11 known locations along the eastern side in the Grassland and Parkland Natural Regions of the province, with two known stations in the general vicinity of Wainwright (ANHIC 2003). It was initially recorded from the northeastern portion of the Wainwright Dunes Ecological Reserve by Cottonwood Consultants, Ltd. (1986), and was later collected by Derek Johnson in 1992; their records were repeated in the Reserve's management plan (Anon 1998). The 2002 survey of the Reserve refound at least one of the Cottonwood's general locations, and added four general clusters, all within the Reserve's boundaries, to the west, northwest and north northwest of David Lake. The UTM grid location cited by Johnson in 1992 that appeared in the ANHIC Element Occurrence data sheet was relocated and surveyed, but no typical habitat for the species was discovered (see map Sr3).

These five clusters supported 18 sampled species locations that typically varied in size from 1.5 m X 2 m to 4 m X 35 m, and had numbers of plants ranging between 2 and 20 plants, although in one case a 2 m X 4 m area held 60 plants, and in another there were 15 plants spread over an 8 m X 75 m area. The total number of plants of this species discovered within the Ecological Reserve's boundaries was 257 individuals. The plants appeared to have been greatly affected by the prolonged drought conditions, and were producing well-developed inflorescences by mid- to late July, with successful fruit production by mid- to late August, and possibly into early or mid-September. The inflorescences of virtually all the examined plants continuously produced both flowers and fruits between at least a six to eight week period after mid-July, and in all probability each plant had the capability of producing over 50 viable seeds. Since this species is an annual, the current year's plants would disappear at the end of the season, and the limiting factor in establishing the following year's populations through seed germination may well be the presence of rainfall, as well as the deposition of the seeds on suitable sandy habitat. Nevertheless, with the 2002 growing season was markedly devoid of rainfall with only rare cloudburst downpours or very brief, transient light rains. Nevertheless, such moisture conditions apparently were sufficient for the species to have become reestablished at many of the potential sites examined during the project.

The prime habitat for this species within the Ecological Reserve was the subxeric to xeric, semiopen sand of the southwest-facing, semiactive to active erosion faces on the upper to middle slopes and draws along the sand dune ridge blowout basins. The associated community here was composed of *Calamovilfa longifolia, Stipa curtiseta, Koeleria macrantha, Carex pensylvanica* var. *digyna, Elymus canadensis (Canada wild rye), Oryzopsis hymenoides, Sporobolus cryptandra, Carex obtusata, Carex siccata, Carex praegracilis, Lygodesmia juncea, Festuca saximontana, Helianthus couplandii, Heterotheca villosa* and others, including the provincially rare *Cyperus schweinitzii* and *Chenopodium leptophyllum*. In may instances the plants occurred along the uppermost reaches of the erosion face slope, but also extended locally toward, but only barely into, the low thickets that were fringing the dune ridge crests. Here the associated species included *Prunus virginiana, Juniperus communis, Rosa acicularis, Calamovilfa longifolia, Rhus radicans* var. *rydbergii (poison ivy)* and others, as well as *Lygodesmia juncea*, which often formed a diffuse tangle that obscured the presence of the plants. In only one instance did it occur in the lower slope of a semiactive to semistable blowout basin, with an associated community dominated by *Cyperus schweinitzii*.

The main habitat threat to this species probably is the prolonged drought conditions in the region, although it appears to have been successful in surviving the drought of the past several years. Erosion and deposition from blowing sand may remove the seed bank from suitable germination sites, and in only one instance was a current population immediately in danger of being buried in actively depositing dune sand. Cattle grazing was not evident in any of the sites examined, but one dune ridge in the western portion of the reserve did have some evidence of an all terrain vehicle ("quad") using the sandy slopes for unauthorized travel.

The management considerations for this species should include monitoring the known populations in order to establish what the regeneration success might be from the previous years' seed production. Since this is an annual, but apparently with a good potential for seed production and apparently an ability to germinate readily, such monitoring would be valuable in realizing further management actions required to preserve the species. Additionally, there likely are more populations in the semiactive sand dune ridge blowout situations elsewhere within the Reserve, and further surveying probably would be fruitful. The infringement of all terrain vehicle traffic on the sand dune ridge blowouts should be actively discouraged, so as to protect this sensitive and significant habitat.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Shinneroseris rostrata* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	wind (2), insulation (3)
Flood Hazard	not apply
Soil Drainage	rapidly drained (2)
Perviousness	rapidly (1)
Site: Macro	not apply
Site: Meso	upper slope (2), mid-slope (3), lower slope (4)
Site: Micro	straight (1)
Site: Surface Shape	concave (2)
Ecological Moisture Regime	very xeric (1), xeric (2)
Nutrients	?submesotrophic (2)
Successional Status: 1	pioneer (1)
Successional Status: 2	not apply
Disturbance Factors	not apply

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	mid-July
Phenology: reproductive – inflorescence	early to mid- to late August, early September
Phenology: reproductive – flower	early to mid- to late August, to early September
Phenology: reproductive – fruit	mid- to late August, to early to mid-September
Habitat Threats	wind erosion, grazing
Management Considerations	monitoring populations and drought impacts

Photo: *Shinneroseris rostrata* (annual skeletonweed)
plant detail: growth habit with flowering inflorescence
(Sr17—Shinros-020816b—O8, photo Ian D. Macdonald)

APPENDIX 20: WAINWRIGHT DUNES ECOLOGICAL RESERVE VASCULAR PLANT FLORA

The following compilation list of vascular plant species that have been confirmed from within the boundaries of the Wainwright Dunes Ecological Reserve. It is based on the several reports and observation and collection notes made between 1977 and 2002, notably Bradley & Bradley (1977), Fehr (1984), Cottonwood Consultants, Ltd. (1986), Wallis (1990), the reserve's management plan (1998), Miejer (2001), Johnson (1992), Cotterill (2000), Alberta Natural Heritage Information Centre (ANHIC) (2002) and the author (Macdonald 2002). There are 418 confident records and an additional 8 tentative records that have been confirmed as occurring within the current ecological reserve's boundaries. The largest families listed here are Asteraceae (62 species), Poaceae (55) and Cyperaceae (53). Only 33 species are non-natives, generally with Eurasian origins. The reserve represents a transition between the southern Boreal and Grassland Subregions; over 50 species represent extensions to their ranges as mapped in the *Flora of Alberta*; for the most part these are some 50 km to 100 km from their next-nearest Grassland, Parkland and southern Boreal locations, but in several cases they are considerable distances from their Rocky Mountain or far northern or western Parkland ranges, as with *Minuartia dawsonensis, Silene menziesii* and *Thalictrum occidentale*. Of note are the 19 taxa that are currently listed by ANHIC as being provincially rare in Alberta, including *Botrychium multifidum* var. *intermedium, Elodea ?bifoliata, Najas flexilis, Ruppia cirrhosa, Muhlenbergia asperifolia, Carex crawei, Carex ?houghtoniana, Carex parryana, Cyperus schweinitzii, Eleocharis ?elliptica, Chenopodium leptospermum, Drosera linearis, Asclepias ovalifolia, Gentiana fremontii, Lycopus americanus, Veronica ?catenata, Hedyotis longifolia, Aster pauciflorus* and *Shinneroseris rostrata*. These species are **bolded** in the body of the list.

The plants are presented in the Engler Prantl sequence that appears in the *Flora of Alberta* (Moss 1983), and the nomenclature conforms to that used by ANHIC. Where there have been revisions to the nomenclature that are current elsewhere, or where it differs from the original citation, the synonyms are indicated with brackets: (=). In many cases the subspecific or varietal level appropriate to the Alberta flora is added by the author, but was not included in the original lists of the previous surveyors. Species that are not native to Alberta are indicated by an asterisk (*) following the species name, and a question mark (?) indicates some query for the occurrence record. Species that occur immediately adjacent to the reserve boundaries and may be expected within the reserve are in parentheses.

FERNS AND FERN ALLIES

LYCOPODIACEAE

Lycopodium clavatum subsp. *monostachyon*

SELAGINELLACEAE

Selaginella densa var. *densa*

EQUISETACEAE

Equisetum arvense var. *arvense*, *Equisetum fluviatile*, *Equisetum hyemale* var. *affine*, *Equisetum pratense*, *Equisetum variegatum* subsp. *variegatum*

OPHIOGLOSSACEAE

Botrychium multifidum* var. *intermedium

GYMNOSPERMS

CUPRESSACEAE

Juniperus communis var. *depressa*, *Juniperus horizontalis*

MONOCOTYLEDONS

TYPHACEAE

Typha latifolia

SPARGANIACEAE

Sparganium angustifolium var. *chlorocarpum* (= *Sparganium chlorocarpum*), *Sparganium* (*species*)

POTAMOGETONACEAE

Potamogeton pectinatus (= *Stuckenia pectinata*), *Potamogeton zosteriformis*

NAJADACEAE

Najas flexilis

RUPPIACEAE

Ruppia cirrhosa (= *R. maritima* var. *occidentalis*)

ZANICHELLIACEAE

Triglochin maritimum, Triglochin palustris

ALISMATACEAE

Alisma plantago-aquatica, Sagittaria cuneata

HYDROCHARITACEAE

Elodea ?bifoliata (= Elodea canadensis, E. longivaginata)

POACEAE

(*X Agrohordeum macounii*), *Agropyron desertorum**, *Agropyron fragile**, *Agropyron pectiniforme**, *Agropyron repens**, *Agropyron smithii* var. *smithii*, *Agropyron trachycaulum* var. *trachycaulum*, *Agropyron trachycaulum* var. *subsecundum* and var. *glaucum* (= *Elymus trachycaulus* subsp. *subsecundus*), *Agrostis scabra, Agrostis stolonifera* var. *palustris*(*), *Alopecurus aequalis, Beckmannia syzigachne* subsp. *baicalensis, Bouteloua gracilis, Bromus anomalus**, *Bromus inermis* subsp. inermis*, *Calamagrostis canadensis, Calamagrostis inexpansa* (= *Calamagrostis stricta* subsp. *inexpansa*), *Calamagrostis stricta* subsp. *stricta, Calamovilfa longifolia* var. *longifolia, Catabrosa aquatica, Danthonia intermedia, Deschampsia cespitosa* var. *cespitosa, Distichlis stricta* var. *stricta, Elymus canadensis* var. *brachystachys, Festuca campestris* (= *Festuca scabrella*), *Festuca saximontana*, (*Festuca trachyphylla**), *Glyceria borealis, Glyceria grandis, Glyceria striata* var. *stricta, Helictotrichon hookeri, Hierochloe odorata* subsp. *odorata* (= *Anthoxanthum nitens*), *Hordeum jubatum* subsp. *jubatum, Koeleria macrantha* forma *macrantha* (= *Koeleria cristata*), ***Muhlenbergia asperifolia***, *Muhlenbergia glomerata, Muhlenbergia richardsonis, Oryzopsis asperifolia, Oryzopsis hymenoides, Oryzopsis pungens, Phleum pratense**, *Poa arida, Poa compressa* (*), *Poa interior, Poa palustris, Poa pratensis* var. *pratensis**, *Poa sandbergii, Puccinellia nuttalliana, Schizachne purpurascens* var. *purpurascens, Scolochloa festucacea, Sphenopholis intermedia* (= *Sphenopholis obtusata* var. *major*), *Sporobolus cryptandrus, Stipa comata, Stipa curtiseta* (= *Stipa spartea* var. *curtiseta*), *Stipa viridula* (= *Nassella viridula*)

CYPERACEAE

Carex aquatilis var. *aquatilis, Carex atherodes Carex aurea, Carex bebbii, Carex canescens* (= *Carex curta*), *Carex capillaris* subsp. *chlorostachys, Carex* *chordorrhiza*, **Carex crawei**, *Carex crawfordii*, *Carex diandra*, *Carex disperma*, *Carex douglasii*, *Carex filifolia*, *Carex gynocrates* (= *Carex dioica*), **Carex ?houghtoniana**, *Carex interior*, *Carex lanuginosa* (= *Carex lasiocarpa* var. *latifolia*), *Carex lasiocarpa* var. *americana*, *Carex leptalea*, *Carex limosa*, (*Carex livida*), (*Carex microptera*), *Carex obtusata*, **Carex parryana subsp. parryana**, *Carex peckii*, *Carex pensylvanica* var. *digyna* (= *Carex inops* subsp. *heliophila*), *Carex praegracilis*, *Carex prairea*, *Carex sartwellii*, *Carex scirpoidea* var. *scirpoidea*, *Carex siccata*, *Carex sprengelii*, *Carex stenophylla* subsp. *eleocharis* (= *Carex eleocharis*), *Carex tenuiflora*, *Carex utriculata* (= *Carex rostrata* var. *utriculata*), *Carex vaginata*, *Carex viridula*, *Cyperus schweinitzii*, *Eleocharis acicularis*, **Eleocharis ?elliptica** (= *Eleocharis compressa* var. *?borealis*), *Eleocharis palustris* (= *Eleocharis erythropoda*), *Eleocharis quinqueflora* (= *Eleocharis pauciflora* var. *fernaldii*), *Eriophorum chamissonis*, *Eriophorum gracilis*, *Eriophorum polystachion* (= *Eriophorum angustifolium*), *Eriophorum viridi-carinatum*, *Scirpus acutus*, *Scirpus caespitosus*, *Scirpus microcarpus* var. *rubrotinctus*, *Scirpus pungens* subsp. *pungens* (= *Scirpus americanus*), *Scirpus validus*

LEMNACEAE

Lemna minor, *Lemna trisulca*

JUNCACEAE

Juncus alpinoarticulatus, *Juncus balticus* var. *littoralis* (= *Juncus arcticus* var. *littoralis*), *Juncus bufonius*, *Juncus longistylis*, *Juncus nodosus*, *Juncus tenuis* var. *dudleyi*, *Luzula multiflora* (= *Luzula campestris* var. *multiflora*)

LILIACEAE

Allium textile, *Disporum trachycarpum*, *Lilium philadelphicum* var. *andinum*, *Maianthemum canadense*, *Smilacina stellatum* (= *Maianthemum stellata*), *Smilacina trifolium* (= *Maianthemum trifolia*), *Tofieldia glutinosa* var. *glutinosa*, *Zigadenus elegans* subsp. *elegans*

IRIDACEAE

Sisyrinchium montanum var. *montanum*

ORCHIDACEAE

Corallorhiza trifida, *Cypripedium calceolus var. parviflorum*, *Habenaria dilatata* (= *Platanthera dilatata* var. *dilatata*), *Habenaria hyperborea* (= *Platanthera* *hyperborea*), *Habenaria obtusata* (= *Platanthera obtusata*), *Habenaria viridis* var. *bracteata* (= *Coeloglossum viride*), *Spiranthes romanzoffiana*

CHORIPETALOUS DICOTYLEDONS

SALICACEAE

Populus balsamifera var. *balsamifera*, *Populus balsamifera* var. *?trichocarpa*, *Populus tremuloides* var. *tremuloides*, *Salix bebbiana* var. *bebbiana*, *Salix candida*, *Salix discolor*, (*Salix lutea*), *Salix maccalliana*, *Salix myrtillifolia* var. *cordata*, *Salix myrtillifolia* var. *?myrtillifolia*, *Salix pedicellaris*, *Salix petiolaris*, *Salix planifolia* subsp. *planifolia*, *Salix pseudomonticola*, *Salix serissima*

BETULACEAE

(*Alnus tenuifolia* (= *Alnus incana* subsp. *tenuifolia*)), *Betula neoalaskana*, *Betula occidentalis* var. *occidentalis*, *Betula papyrifera* var. *papyrifera*, *Betula pumila var. glandulifera*, *Corylus cornuta* var. *cornuta*

URTICACEAE

Utrica dioica var. *gracilis* (= *Urtica gracilis*)

SANTALACEAE

Comandra umbellata var. *pallida*

POLYGONACEAE

Polygonum amphibium var. *stipulaceum* (= *Polygonum natans* forma *hartwrightii*), *Polygonum arenastrum**, *Polygonum convolvulus**, *Polygonum erectum*, *Polygonum lapathifolium*, *Rumex acetosella* subsp. *acetosella**, *Rumex maritimus* var. *fueginus*, *Rumex occidentalis*, *Rumex venosus*

CHENOPODIACEAE

*Atriplex prostrata**, *Axyris amaranthoides**, *Chenopodium album**, *Chenopodium gigantospermum*, ***Chenopodium ?leptophyllum***, *Chenopodium pratericola*, *Chenopodium rubrum* var. *rubrum*, *Chenopodium salinum*, *Monolepis nuttalliana*, *Salicornia europaea* subsp. *rubra* (= *Salicornia rubra*), *Salsola kali* var. *tenuifolia**, *Suaeda calceoliformis* (= *Suaeda depressa*)

AMARANTHACEAE

*Amaranthus blitoides**, *Amaranthus retroflexus**

NYCTAGINACEAE

Mirabilis hirsuta

CARYOPHYLLACEAE

*Cerastium arvense, Cerastium vulgatum** (= *Cerastium fontanum* subsp. *vulgare*), *Minuartia dawsonensis, Moehringia lateriflora, Silene drummondii* var. *drummondii, Silene menziesii* var. *menziesii, Stellaria calycantha* var. *calycantha, Stellaria longifolia, Stellaria longipes*

CERATOPHYLLACEAE

(*Ceratophyllum demersum*)

RANUNCULACEAE

Actaea rubra subsp. *rubra, Anemone canadensis, Anemone cylindrica, Anemone multifida* var. *multifida, Anemone multifida* var. *richardsiana, Anemone patens* var. *multifida,* (*Caltha natans*), *Caltha palustris, Ranunculus abortivus, Ranunculus circinatus* (= *Ranunculus subrigidus*), *Ranunculus cymbalaria* var. *cymbalaria, Ranunculus gmelinii* var. *gmelinii, Ranunculus macounii, Ranunculus sceleratus* var. *multifidus, Thalictrum occidentale* var. *occidentale, Thalictrum venulosum* var. *venulosum*

BRASSICACEAE

Arabis divaricarpa var. *divaricarpa, Arabis holboelii* var. *retrofracta,* (*Camelina microcarpa**), *Capsella bursa-pastoris**, *Cardamine pensylvanica, Descurania pinnata* var. *brachycarpa, Descurania sophia**, *Draba nemorosa* var. *leiocarpa, Erysimum asperum* var. *asperum, Erysimum inconspicuum, Lepidium densiflorum* var. *densiflorum, Lepidium ramosissimum, Lesquerella arenosa* var. *arenosa, Rorippa palustris* var. *palustris, Rorippa palustris* var. *?hispida, Sisymbrium altissimum**, *Thlaspi arvense**

DROSERACEAE

Drosera linearis, *Drosera ?anglica,*

SAXIFRAGACEAE

Heucheria richardsonii var. *richardsonii, Mitella nuda*

PARNASSIACEAE

Parnassia palustris var. *neogaea* (= *Parnassia montanensis*)

GROSSULARIACEAE

Ribes americanum, Ribes hirtellum, Ribes lacustre, Ribes oxyacanthoides, Ribes triste

ROSACEAE

(*Agrimonia striata*), *Amelanchier alnifolia* var. *alnifolia, Chamaerhodos erecta* var. *nuttallii, Crataegus rotundifolia* (= *Crataegus chrysocarpa*), *Fragaria virginiana* var. *glauca, Geum aleppicum* var. *strictum, Geum macrophyllum* var. *?macrophyllum, Geum macrophyllum* var. *perincisum, Geum triflorum* var. *triflorum, Potentilla anserina* subsp. *anserina, Potentilla arguta, Potentilla concinna* var. *concinna, Potentilla gracilis* var. *flabelliformis, Potentilla hippiana* var. *hippiana, Potentilla norvegica* var. *norvegica, Potentilla palustris* var. *palustris, Potentilla pensylvanica* var. *pensylvanica, Potentilla rivularis, Prunus pensylvanica* var. *pensylvanica, Prunus virginiana* subsp. *melanocarpa, Rosa acicularis, Rosa woodsii* subsp. *woodsii, Rubus idaeus* subsp. *melanolasius* (= *Rubus strigosus*), *Rubus pubescens, Spiraea alba* var. *alba*

FABACEAE

Astragalus dasyglottis, (*Astragalus flexuosus*), *Astragalus striatus, Glycerrhiza lepidota* var. *lepidota, Lathyrus ochroleucus, Lathyrus venosus* subsp. *intonsus, Medicago sativa* subsp. *sativa**, *Oxytropis monticola* (= *Oxytropis campestris* var. *gracilis*), *Oxytropis sericea* var. *spicata, Psoralea argophylla, Thermopsis rhombifolia, Trifolium hybridum, Vicia americana* var. *americana, Vicia americana* var. *minor* (= *Vicia sparsifolia*)

GERANIACEAE

Geranium richardsonii

LINACEAE

Linum lewisii subsp. *lewisii* (= *Linum perenne*)

EUPHORBIACEAE

Chamaesyce glyptospermum (= *Euphorbia glyptosperma*)

CALLITRICHACEAE

Callitriche verna (= *Callitriche palustris*)

ANACARDIACEAE

Rhus radicans var. *rydbergii* (= *Toxicodendron radicans* var. *rydbergii*)

MALVACEAE

Sphaeralcea coccinea var. *coccinea*

CISTACEAE

Hudsonia tomentosa

VIOLACEAE

Viola adunca, Viola canadensis var. *rugulosa* (= *Viola rugulosa*), *Viola nephrophylla, Viola ?nuttallii* var. *major, Viola ?renifolia*

CACTACEAE

Opuntia fragilis

ELAEAGNACEAE

Elaeagnus commutata, Shepherdia canadensis

ONAGRACEAE

Epilobium angustifolium subsp. *angustifolium, Epilobium ciliatum* subsp. *glandulosum* (= *Epilobium glandulosum*), *Epilobium leptophyllum, Gaura coccinea* var. *coccinea, Oenothera biennis, Oenothera nuttallii*

HALORAGACEAE

Myriophyllum exalbescens (= *Myriophyllum spicatum*)

HIPPURIDACEAE

Hippuris vulgaris

ARALIACEAE

Aralia nudicaulis

APIACEAE

Cicuta bulbifera, Cicuta maculata var. *angustifolia* (= *Cicuta douglasii*), *Heracleum lanatum, Osmorhiza depauperata, Sancula marilandica, Sium suave, Zizia aptera* var. *occidentalis*

CORNACEAE

Cornus canadensis, Cornus stolonifera var. *stolonifera* (= *Cornus sericea*)

SYMPETALOUS DICOTYLEDONS

PYROLACEAE

Moneses uniflora var. uniflora, Orthilia secunda subsp. *secunda* (= *Pyrola secunda*), *Pyrola asarifolia* var. *asarifolia, Pyrola chlorantha*

ERICACEAE

Arctostaphylos uva-ursi

PRIMULACEAE

Androsace septentrionalis, Dodecatheon pulchellum subsp. *pulchellum* (=*Dodecatheon radicatum*), *Glaux maritima* subsp. *maritima, Lysimachia ciliata* (= *Steironema ciliatum*), *Lysimachia thyrsiflora, Primula incana*

GENTIANACEAE

Gentiana fremontii*, Gentianella amarella* subsp. *acuta, Gentianella crinita* subsp. *macounii* (= *G. macounii*)

MENYANTHACEAE

Menyanthes trifoliata

APOCYNACEAE

Apocynum androsaemifolium var. *androsaemifolium*

ASCLEPIADACEAE

Asclepias ovalifolia

POLEMONIACEAE

Collomia linearis, Phlox hoodii subsp. *canescens*

BORAGINACEAE

Cryptantha fendlerii, Hackelia americana Lappula occidentalis, (= *Lappula redowskii*), *Lithospermum incisum*

LAMIACEAE

Dracocephalum parviflorum (= *Moldavia parviflora*), ***Lycopus americanus****, Lycopus asper, Mentha arvensis* var. *glabrata, Monarda fistulosa* var. *menthaefolia, Prunella vulgaris* subsp. *lanceolatus, Scutellaria galericulata* var. *pubescens, Stachys palustris* var. *pilosa*

SOLANACEAE

Solanum triflorum

SCROPHULARIACEAE

Castilleja miniata, Orthocarpus luteus, Pedicularis groenlandica, (*Penstemon gracilis*), (*Veronica americana*), (***Veronica catenata*** (= *Veronica salina*)), *Veronica peregrina* var. *xalapensis*

OROBANCHACEAE

(*Orobanche fasciculata* var. *fasciculata*)

LENTIBULARIACEAE

Pinguicula vulgaris var. *vulgaris*, *Utricularia intermedia*, *Utricularia minor*, *Utricularia vulgaris* subsp. *macrorhiza*

PLANTAGINACEAE

Plantago major var. *major**

RUBIACEAE

Galium boreale var. *intermedium*, *Galium labradoricum*, *Galium trifidum* var. *trifidum*, *Galium triflorum*, ***Hedyotis longifolia*** (= *Houstonia longifolia*)

CAPRIFOLIACEAE

Linnaea borealis var. *americana*, *Lonicera dioica* var. *glaucescens*, *Symphoricarpos albus* var. *albus*, *Symphoricarpos occidentalis*, *Viburnum edule*, *Viburnum opulus* var. *americanum* (= *Viburnum trilobum*)

CAMPANULACEAE

Campanula rotundifolia

LOBELIACEAE

Lobelia kalmii

ASTERACEAE

Achillea millefolium subsp. *lanulosa*, *Agoseris glauca*, *Ambrosia artemisiifolia* var. *elatior*, *Antennaria parvifolia*, (*Antennaria pulcherrima*), *Artemisia biennis*, *Artemisia campestris* subsp. *caudata* (= *Artemisia forwardii*), *Artemisia dracunculus* var. *dracunculus*, *Artemisia frigida* var. *frigida*, *Artemisia ludoviciana* var. *ludoviciana*, *Artemisia ludoviciana* var. *gnaphaloides*, *Aster borealis* (= *Aster junciformis*) , *Aster brachyactis*, *Aster ciliolatus*, *Aster ericoides* subsp. *pansus* (= *Aster pansus*, *Virgulus ericoides*), *Aster hesperius* var. *hesperius*, *Aster laevis* var. *geyeri*, ***Aster pauciflorus*** (= *Almutaster pauciflorus*), *Bidens cernua*, *Cirsium arvense* var. *arvense**, *Cirsium flodmanii*, *Cirsium undulatum*, *Cirsium vulgare**, *Crepis runcinata* subsp. *runcinata*, *Crepis tectorum**, *Erigeron annuus* subsp. *septentrionalis* (= *Erigeron strigosus*), *Erigeron caespitosus*, *Erigeron ?elatus*, *Erigeron glabellus* subsp. *glabellus*, *Erigeron glabellus* subsp. *pubescens*, *Erigeron lonchophyllus*, *Erigeron philadelphicus*, *Gaillardia aristata*, *Gridelia squarrosa* var. *squarrosa*, *Helenium autumnale* var.

montanum, Helianthus couplandii, Helianthus subrhomboideus (= *Helianthus laetiflorus var. subrhomboideus*), *Heterotheca villosa* var. *villosa* (= *Chrysopsis villosa*), *Lactuca pulchella subsp. pulchella*, (*Liatris ligulistylis*), *Lygodesmia juncea, Matricaria matricarioides** (= *Matricaria suaveolens*), *Petasites frigidus* var. *palmatus* (= *Petasites palmatus*), *Petasites sagittatus* (= *Petasites frigidus var. sagittatus*), *Petasites vitifolius, Ratibida columnifera, Senecio canus* (= *Packera cana*), *Senecio congestus, Senecio pauperculus* (= *Packera paupercula*), ***Shinneroseris rostrata*** (= *Lygodesmia rostrata*), *Solidago canadensis* var. *canadensis, Solidago gigantea* var. *serotina, Solidago graminifolia* (= *Euthamia graminifolia var. graminifolia*), *Solidago missouriensis* var. *fasciculata, Solidago nemoralis* var. *longipetiolata, Solidago rigida, Solidago spathulata* var. *neomexicana* (= *Solidago decumbens* var. *ereophila*), *Sonchus uliginosus**, (= *Sonchus arvensis* var. *uliginosus*), *Sonchus asper**, *Taraxacum officinale**, *Tragopogon dubius**

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A Rare Plant Survey of the Wainwright Dunes Ecological Reserve

Supplementary Data

Resource Data Branch, Strategic Corporate Services

Alberta
SUSTAINABLE RESOURCE
DEVELOPMENT

A RARE PLANT SURVEY
OF THE
WAINWRIGHT DUNES
ECOLOGICAL RESERVE

SUPPLEMENTARY DATA

by

Ian D. Macdonald
Calgary AB / Terre Haute IN

March 2003

for

Alberta Sustainable Resource Development
Resource Data Branch
Public Lands Division
Edmonton AB

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Carex parryana Dewey var. *parryana*—Parry's sedge—*CYPERACEAE* 73
Cyperus schweinitzii Torr.—sand nut-grass—CYPERACEAE 94
Eleocharis elliptica Kunth—slender spike-rush—*CYPERACEAE* 119
Chenopodium leptophyllum (Nutt. *ex* Moq.) Nutt. *ex* S. Wats.—narrow-leaved goosefoot—*CHENOPODIACEAE* 125
Drosera linearis Goldie—slender-leaved sundew—*DROSERACEAE* 136
Gentiana fremontii Torr.—marsh gentian—*GENTIANACEAE* 147
Asclepias ovalifolia Dcne.—low milkweed—*ASCLEPIADACEAE* 165
Lycopus americanus Muhl. *ex* W.C. Barton—American water-horehound—*LAMIACEAE* 183
Veronica catenata Pennell.—water speedwell—*SCROPHULARIACEAE* 210
Hedyotis longifolia (Gaertn.) Hook.—long-leaved bluets—*RUBIACEAE* 215
Aster pauciflorus Nutt.—few-flowered aster—*ASTERACEAE* 220
Shinnersoseris rostrata (A. Gray) S. Tomb—annual skeletonweed—*ASTERACEAE* 236

WAINWRIGHT DUNES ECOLOGICAL RESERVE VASCULAR PLANT FLORA 258
WAINWRIGHT DUNES ECOLOGICAL RESERVEVASCULAR PLANT FLORA OF THE GREAT FEN 280
WAINWRIGHT DUNES ECOLOGICAL RESERVE VASCULAR PLANT FLORA OF SLOPE FEN 282

Front cover photos courtesy of Patrick Porter, Public Lands Officer, Public Lands and Forests Division, Alberta Sustainable Resource Development, Wainwright, Alberta.

INTRODUCTION

The Wainwright Dunes Ecological Reserve is located in the eastern portion of the Parkland Natural Region in Alberta, approximately 30 km SSE of the town of Wainwright, and adjacent to the southern border of the southeastern arm of CFB Wainwright. This 2 821 ha (6 970 ac.) area is an Ecological Reserve established under legislation administered by Alberta Community Development, Parks and Protected Areas, and managed in cooperation with Alberta Sustainable Resource Development, Public Lands Division.

This is a collection of the location, plant number, habitat and associated specimen collection, photographic and mapping information for the 11 species of vascular plants that were recorded in the Wainwright Dunes Ecological Reserve during the 2002 rare plant survey by Ian D. Macdonald, and for the additional eight species that previously were reported in the Reserve and its vicinity by previous studies (Bradley & Bradley 1977, Fehr 1984, Cottonwood Consultants, Ltd. 1986, Pearson Timberline Forestry Consultants 1993, Wallis 1990, Johnson 1992, Anon 1998, Cotterill 2000, Meijer 2001, ANHIC 2002). This study was conducted in order to provide additional information of those provincially rare plant species that had been reported from the area. This is a companion volume to a report prepared for Alberta Sustainable Resource Development, Public Lands Division, Edmonton (Macdonald 2003). Additionally the information will contribute to the Rare Plant Data Base of the Alberta Natural Heritage Information Centre, Alberta Community Development, Parks and Protected Areas Division, Edmonton. A compilation volume of the photographs documenting the species locations and habitats, and a file of the species plant location and habitat diagrams are retained at the Alberta Natural Heritage Information Centre offices and at the Wainwright Field Office of Alberta Sustainable Resource Development, Public Lands Division.

The author may be contacted if additional clarification is required for the enclosed information at 1916 S 30 St, Terre Haute, IN 47803, tel. (812) 238-0443, or through the ANHIC offices.

METHOD

Alberta Sustainable Resource Development, Resource Data Branch contracted the author to conduct an inventory of the provincially rare vascular plants that had been reported from within the Ecological Reserve with a view to confirming their locations, habitats, population sizes and potential habitat threats and management concerns in order to provide a better understanding of their situation and requirements, to provide effective management for their protection and maintenance and to provide a database for documenting their occurrences.

Prior to and concurrent with the on-site survey, the above listed references and authorities were consulted to gain a familiarity with the natural features of the Ecological Reserve and to form a "search image" for the various species; this was documented in the Preliminary Report (Macdonald June 2002). Previously reported records for provincially rare species were relocated by referring to the ANHIC (2002) data base for rare species, and where possible, to the several reports on the natural features of the Reserve (listed above) and through interviews with authorities familiar with the area (Harry Loonen and Patrick Porter, Alberta Sustainable Resource Development, Public Lands Division, Wainwright and Cliff Wallis, Cottonwood Consultants, Ltd., Calgary). In many cases, these reports served as a guide to the discovery of new locations for the provincially rare species in the Reserve.

The 2002 on-site investigation rare vascular plant survey of the Wainwright Dunes Ecological Reserve was conducted by the author within the Reserve's boundaries, and occasionally just beyond them, over a 20 day period in the 2002 growing season in early summer (13–16 June), mid-summer (10–12, 14–21 July) and late summer (15–19 August). The survey of the rare vascular plants followed the general guidelines recommended by the Alberta Native Plant Council (Lancaster 2000). During this phase of the project the author conducted a survey of the apparent potential habitat situations for the various species as was possible in the time-frame allowed within the study area. Due to their potential for supporting rare vascular plant species, particular attention was given to those habitats associated with the sand dune ridge blowout, seepage slope, patterned fen, lake backshore to offshore, and other wetlands. All species locations were accessed on foot to minimize damage to the sensitive terrain and vegetation, and allowed a more thorough survey along the routes between them. Rare species locations that were discovered were temporarily demarcated on the ground with flags so that the number of individuals could be accurately counted or estimated, and their extent measured and mapped, and individuals collected for verification, but only where the population would not be compromised. The results of the investigations were recorded on-site with the author's open file format, copies of which submitted to Alberta Sustainable Resource Development, Resource Data Branch office in Edmonton, and are retained on file at the

Alberta Natural Heritage Information Centre, Alberta Community Development, Parks and Protected Areas Division offices in Edmonton. This information included all the data requirements of Alberta Environment's Site Description Form and ANHIC's Rare Native Plant Report Form. The following critical items were recorded: 1) rare species name; 2) location using a GPS unit (Eagle Explorer 1996) to determine latitude and longitude to degree and minute in thousandths and occasionally the 1927 datum Universal Transverse Mercator grid coordinates (UTM27) as well, and where accuracy was ensured, an aerial photograph was pierced and labelled at the exact or nearest accurate point; 3) site characteristics, including terrain type, substrate, moisture regime, aspect and slope; 4) associated community pattern, noting for each of the species the tree, tall shrub, low shrub and herb strata they occurred in, and their cover values in closure categories of >95%, 75–95%, 50–75%, 20–50%, 5–20%, 1-5% and <1%; 5) extent and number of individual plants by direct count or estimation as defined by the growth characteristics that appeared to be appropriate for enumerating the species, such as with discrete individuals, or leaf and inflorescence clusters along a rhizome chain; 6) phenology and growth condition of the rare plant species indicating stage of development, flowering or fruiting success; 7) present and potential threats to the habitat and the immediate vicinity; 8) notes on potential management concerns for the species; 9) notes on field identification characteristics that might aid future surveyors in locating the species; 10) map using planar view or oblique pictorial viewpoint indicating the species' extent in the area and the position of the pink surveyor's flagging tape that acts as a permanent reference to mark the location; 11) photograph to illustrate the plant growth, habitat detail and population extent; and 12) collection number of the rare and other associated species for future herbarium label preparation.

Following the on-site survey, the collected specimens were prepared by drying, then determined or confirmed by the author, inspected and confirmed by Bonnie M. Smith of the University of Calgary Herbarium, and sent to ANHIC in Edmonton for further confirmation by Patsy Cotterill at Alberta Community Development, Parks and Protected Areas. They were deposited for future reference in the herbaria of the University of Alberta (ALTA) and Alberta Community Development, Parks and Protected Areas (PP), both in Edmonton and of the University of Calgary (UAC) in Calgary. The on-site notes were clarified and corrected where necessary, and critical habitat information pertinent to the Ecological Land Survey Description forms of Alberta Sustainable Resource Development and the Rare Native Plant Report Information form of ANHIC were prepared, and the collected species data were summarized in the formatted presentation as species location reports for each of the rare species (see below).

SPECIES LOCATION DATA REPORTS

The following text summarizes the overall findings for each of the 19 provincially rare vascular plant species that have been reported from or have been discovered within the Wainwright Dunes Ecological Reserve and its immediate vicinity. The information for each species is presented in two sections, the first an overall summary and includes its current provincial Rank in Alberta (Vujnovic & Gould 2002), a brief description of the major diagnostic characteristics by which the species may be distinguished from similar species, its continental and provincial distribution and location within the Ecological Reserve, the population size and extent at the locations, the habitats which support the species, habitat threats, and management concerns. Also included are a map indicating the locations of the species locations within the Ecological Reserve, and a selected photograph that illustrates the growth habit of the plants in the Reserve, a list of the cited references, and the following four tables: 1) summary of the information required in the Alberta Environment Ecological Land Survey Site Description Form and the ANHIC Rare Native Plant Report Form; 2) summarizing the map/date site codes, location coordinates (lat./long. or UTM27), number of plants and extent of the plants at the site, and general habitats for the species; 3) a summary of the available photographs from the Reserve that illustrate the plants and their habitats; 4) sketch maps and line diagrams of the habitats and the locations of the plants within the sites.

The second section is a more detailed and formatted information presentation for each species as individual element occurrence reports, which are accompanied by the figures of planar or oblique view of the locations and population extents, and the complete set of photographs taken during the survey to illustrate the species' growth habits, inflorescences, populations and habitats. The format for each of these reports is as follows:

map/date site: The identifying number assigned to each species location for each known record from the past and current encounters with the species was derived from the date of the observation following the format year/month/day (yymmdd) with the alphabetical sequenced occurrence of the site on that day, as for example, 020722e is the fifth site on 22 July 2002. Additionally, for mapping purposes a simpler code of the first letter of the genus and species with a chronologically sequential number was used, as for example, As3 is the third record from the Reserve of *Asclepias ovalifolia*.

location: Locations of the species locations are identified as actually being either within the present boundaries of the Wainwright Dunes Ecological Reserve (WDER) or rather adjacent to it. For general orientation purposes, these further are located within the study area as a distance and general compass direction from a standard point, being the cattle post (called the "monument") near the southern end of the peninsula at the northwestern end of David Lake. More accurate locations are presented as latitude and longitude to thousandths of a minute (approximately 5 m for latitude to 2.5 m for longitude) to an accuracy of 0.025 minutes (and often actually 0.005 minutes), derived at the site from a GPS reader (Eagle Explorer 1996). As well, the Universal Transverse Mercator grid for the 1927 datum (UTM27) measurement is occasionally provided, also derived from GPS readings at the site.

collections: Specimens of the significant species were taken at least once from within the area, but only where the population would not be compromised, following the guidelines of Lancaster (2000). These specimens were prepared acccording to standard herbarium procedure, labelled and deposited in a recognized herbarium in Calgary (UAC - University of Calgary) and / or Edmonton (ALTA - University of Alberta), or elsewhere as directed (PP - Alberta Parks and Protected Areas). Otherwise, where the population size or conditions were not appropriate, photographs and partial specimens sufficed for confirmation purposes. The collections of the author were numbered according to a sequential number from the collection date and site (see above), as for example, 020722e2 is the second collection at the fifth site on 22 July 2002.

photos: 35 mm colour photographs were taken of a view of the general site and habitat, a more detailed view of a typical portion of the habitat to ascertain the associated community and plant conditions, and a portrait of a representative plant of the species, and other details of the plants (inflorescences, foliage) were taken where appropriate. These photos are presented in the accompanying compendia, and are identified according to their roll number and frame number; for example, E4 is roll E and frame 4 in that roll. They also are identified with the site's number, latitude / longitude on the back of at least one copy, and a brief description of the feature that is illustrated.

plant numbers: The number of individual plants and dimensions of the area which the population occupied is presented, as well as whether the population occurred in separated clusters, their sizes and dimensions, the phenological condition of the population, and other pertinent observations on the species at this location.

note: This category includes pertinent observations on related information about the site conditions, population or habitat, present or potential threats, and management considerations, and whether it was associated with other rare species.

habitats: The general site characteristics are summarized, indicating landform, substrate, moisture regime, aspect, slope and physical situation. The associated plant community and species are presented as a general vegetation class with the several strata and component species listed in order of decreasing cover value in the following percentage cover value groupings: >95%, 75–95%. 50–75%, 20–50%, 5–20%, 1–5%, and <1%, as for example, "sand dune ridge upper slope (3□ toward 105° - SSE) and crest in subxeric sand with young semiopen grove of TREE (semiclosed to semiopen) Populus tremuloides; SHRUB (semiopen) Prunus virginiana – Corylus cornuta; HERB (semiclosed to closed) 50–75% Agropyron trachycaulum – Thalictrum venulosum – Carex siccata; 5–20% Thermopsis rhomboidea – Galium boreale; 1–5% Oryzopsis asperifolia; <1% Schizachne purpurascens – Achillea millefolium – **Asclepias ovalifolium** – Solidago missouriensis"

For each of the rare species reports, the reader is referred to the accompanying compilation volume of the photographs documenting the species habitat and locations, and the file of the species plant location habitat and diagrams are retained at the Alberta Natural Heritage Information Centre offices, and at the Wainwright Field Office of Alberta Sustainable Resource Development, Public Lands Division.

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Botrychium multifidum (S.G. Gmelin) Rupr. ***var. intermedium*** (D.C. Eat.) Farw.**—leather grape fern—OPHIOGLOSSACEAE**

This low woodland and field fern has a provincial Rank of **S2** in Alberta and a global rank of **G5T4?** (Vujnovic & Gould 2002, ANHIC 2002). NatureServe (2003) indicated that the authorities for this species are (Gmel.) Trev., and that its other common name is "leathery grape fern". This is one of the more readily recognizable grape ferns in the province. Like the one other large-leaved grape fern that occurs in the province, *Botrychium virginianum* (Virginia grape fern), its sterile blades are relatively large (10 to 25 cm wide, 15 to 35 cm long) and are divided two to three times; however, it differs in that its petiole attachment is near the base of the stalk, the blades are leathery, and it persists through the winter (Moss 1983, Scoggan 1978). It occurs in Alberta as the var. *intermedium* (D.C. Eat.) Farw. (Moss 1983), but the nomenclatural treatment of Wagner & Wagner (1993) in the *Flora of North America* did not recognize this variety.

This species extends across central North America in the boreal and northern temperate zones between Alaska and Newfoundland, and south to California to West Virginia (Wagner & Wagner 1993). It is rare in three provinces, including Alberta, Prince Edward Island and Newfoundland (as well as Labrador), and in ten states (NatureServe 2003). Within Alberta it occurs at 34 known locations, extending between Grande Prairie and east southeast to just east of Edmonton, including an isolated location north of Lake Athabasca (ANHIC 2003, Kershaw *et al.* 2001). The location from the Wainwright Dunes Ecological Reserve was not mapped in the *Rare Vascular Plants of Alberta* (Kershaw *et al.* 2001) or listed in Fehr 1984, but the Element Occurrence Data Base of ANHIC (2003) listed one species location about 400 m north of David Lake, discovered by Patsy Cotterill and others in July 2000. The apparently exact UTM27 grid location within the Ecological Reserve was relocated during the present survey; however, no plants were rediscovered there or in its general vicinity. Further, the anticipated habitat was not an aspen forest as indicated in Cotterill's specimen label, but rather was a balsam poplar forest with an opening, both of which supported a rich complement of northerly species in the gently undulating mesic sand plain that was somewhat removed from the base of the low bluff slope well north of the present-day David Lake shore. Nevertheless, both the closed forest and opening were surveyed to ascertain their Ecological Land Site characteristics.

Patsy Cotterill (2000) reported that she had recorded 20 plants in the area. In this species, the leaves should persist throughout the year with new leaves developing by early to mid-summer, and the fruiting heads should have developed by mid-summer. However, no plants at all were observed during the 2002 survey, and Cotterill (2003 personal communication) confirmed that the surveyed habitat did not conform to her recollection of her species location.

The habitat that was surveyed during 2002 was a mesic, gently rolling sand plain with a balsam poplar forest and an adjacent shrubby clearing, both of which supported a complement of northerly herb species. The forest had a semiclosed to closed tree cover of *Populus balsamifera*, a semiclosed to semiopen tall shrub cover of *Salix bebbiana, Prunus virginiana, Corylus cornuta,* and *Amelanchier alnifolia* (saskatoon), and low shrub cover of *Cornus stolonifera* and *Symphoricarpos occidentalis*, and a semiopen to semiclosed herb cover of *Aralia nudicaulis, Rubus pubescens, Oryzopsis asperifolia, Viola canadensis, Lysimachia ciliata* (fringed loosestrife), *Thalictrum ?occidentale*, and other rich lowland forest species. The clearing supported a semiclosed to locally open tall shrub cover of *Prunus virginiana, Amelanchier alnifolia* and *Corylus cornuta*, semiclosed low shrub cover of *Rosa acicularis, Symphoricarpos occidentalis* and *Rubus idaeus*, and a semiclosed herb cover of *Schizachne purpurascens, Oryzopsis asperifolia, Galium boreale* and others.

Habitat threats to the species could not be determined at this time; however, none were apparent at the location that was surveyed in 2002. The past cutting that formed the clearing may have imposed some impact on the site conditions for the species. No signs of grazing were evident.

Management considerations must first be to relocate the plants, which should be expected still to be standing since they generally tend not to be ephemeral nor intermittent in their yearly growth and are tall enough to be relatively obvious.

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Botrychium multifidum* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION	
Exposure Type	not apply
Flood Hazard	no hazard (1)
Soil Drainage	moderately well drained (4)
Perviousness	moderately (2)
Site: Macro	plain (7)
Site: Meso	level (7)
Site: Micro	straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	mesic (5)
Nutrients	?meso (3)
Successional Status: 1	?mature edaphic climax (6)
Successional Status: 2	not apply
Disturbance Factors	none

ANHIC RARE NATIVE PLANT REPORT	
Phenology: vegetative	no information (?early to mid-summer)
Phenology: inflorescence	no information (?mid- to late summer)
Phenology: sporulating	no information (?mid- to late summer)
Habitat Threats:	no information
Management Considerations	refind population

Species location summary for *Botrychium multifidum* in the Wainwright Dunes Ecological Reserve

map site - date site	location coordinates	number (size)	habitat
Bm1 - Botrmul-000715a	UTM27 526322E 5826805N	20 plants	aspen forest below slope fen
Bm2 - Botrmul-020819c	52°35.553'N 110°36.686'W	not relocated	poplar forest below slope fen

PREVIOUSLY REPORTED SPECIES LOCATIONS

map/date site: Bm1 - Botrmul-000715a
location: Wainwright Dunes Ecological Reserve // David Lake // see map Bm1 // UTM27 526322E 5826805N
source: ANHIC // Element Occurrence PPOPH01033 # 019
reference: —
observation: Cotterill et al. 15 July 2000
collection: Cotterill, P., J.D. Johnson, R. Erdman, R. Wolf & family // 2000-07-15 // PC s.n. // ID-OK // specimen code S00COTPCABCA03
photo: no information
plant numbers: "at least 20 plants, none with sporophores"
note: —
habitat: "aspen forest below slope fen and above upper north shore of David Lake; with Alnus crispa, Rubus idaeus, Rosa (species), Symphoricarpos occidentalis" // 660 m
comment: this UTM27 location is about 400 m north of the north shore of David Lake; it was surveyed (see below), but no plants were discovered

RECENTLY DISCOVERED SPECIES LOCATIONS

map/date site Bm2 - Botrmul-020819c
location: Wainwright Dunes Ecological Reserve; north of David Lake, about 1 km N of peninsula monument; 15-2-42-5W4; see map Bm2
lat./long.: (centre) 52°35.553'N / 110°36.686'W (0.025') (calculated)
UTM27: (centre) 12N 0526322E 5826805N (30m) (GPS)
collection: none
photo: none

plant numbers: no plants relocated

note: the UTM27 coordinates for the element occurrence were indicated by ANHIC as being P. Cotterill's 15 July 2000 location for this species; however, the site that was relocated during this current survey indicated a quite different habitat; two potential habitats were surveyed: 1) poplar forest, 2) opening in poplar forest; no plants observed; nevertheless, this forest composition did include northerly floristic elements; note the record for Thalictrum occidentale (based on vigorous vegetative specimen)

habitat 1: gently rolling mesic sand plain with deciduous forest of TREE (closed) >95% Populus balsamifera; TALL SHRUB (semiclosed to semiopen) 5-20% Salix bebbiana; 1-5% Prunus virginiana - Corylus cornuta; <1% Populus tremuloides (sapling) - Populus balsamifera (sapling); LOW SHRUB (semiclosed) Prunus virginiana - Amelanchier alnifolia; 20-50% Rosa acicularis - Prunus virginiana; 5-20% Cornus stolonifera - Symphoricarpos occidentalis; 1-5% Symphoricarpos albus - Viburnum edule; <1% Ribes oxyacanthoides; HERB (semiopen to semiclosed) 50-75% LITTER; 5-20% Aralia nudicaulis - Rubus pubescens - Oryzopsis asperifolia - Viola canadensis; 1-5% SOIL (sand) - Galium boreale - Maianthemum canadense - Lysimachia ciliata - Thalictrum ?occidentale; <1% Smilacina stellata - Schizachne purpurescens - Actaea rubra - Bromus ciliatus - Lilium philadelphicum - Solidago canadensis - Linnaea borealis - Viola adunca - Lathyrus ochroleucus - Achillea millefolium - Pyrola asarifolia - Sanicula marilandica - Osmorhiza depauperata - Petasites vitifolius - Lonicera dioica

habitat 2: gently rolling mesic sand plain with opening in deciduous forest of TREE (extremely open) 1-5% Populus balsamifera; TALL SHRUB (semiclosed to semiopen) 75-95% Prunus virginiana; 5-20% Amelanchier alnifolia; 1-5% Populus tremuloides (saplings) - Corylus cornuta; LOW SHRUB (semiclosed to semiopen) 20-50% Rosa acicularis - Symphoricarpos occidentalis; 5-20% Corylus cornuta - Prunus virginiana; <1% Rubus idaeus subsp. melanolasius; HERB (semiclosed) 50-75% LITTER; 5-20% Schizachne purpurascens - (unidentified grass); 1-5% Oryzopsis asperifolia - Fragaria virginiana - Taraxacum officinale; <1% Achillea millefolium - Galium boreale - Campanula rotundifolia

Map: Species location for *Botrychium multifidum* in the Wainwright Dunes Ecological Reserve (o indicates approximate reported location)

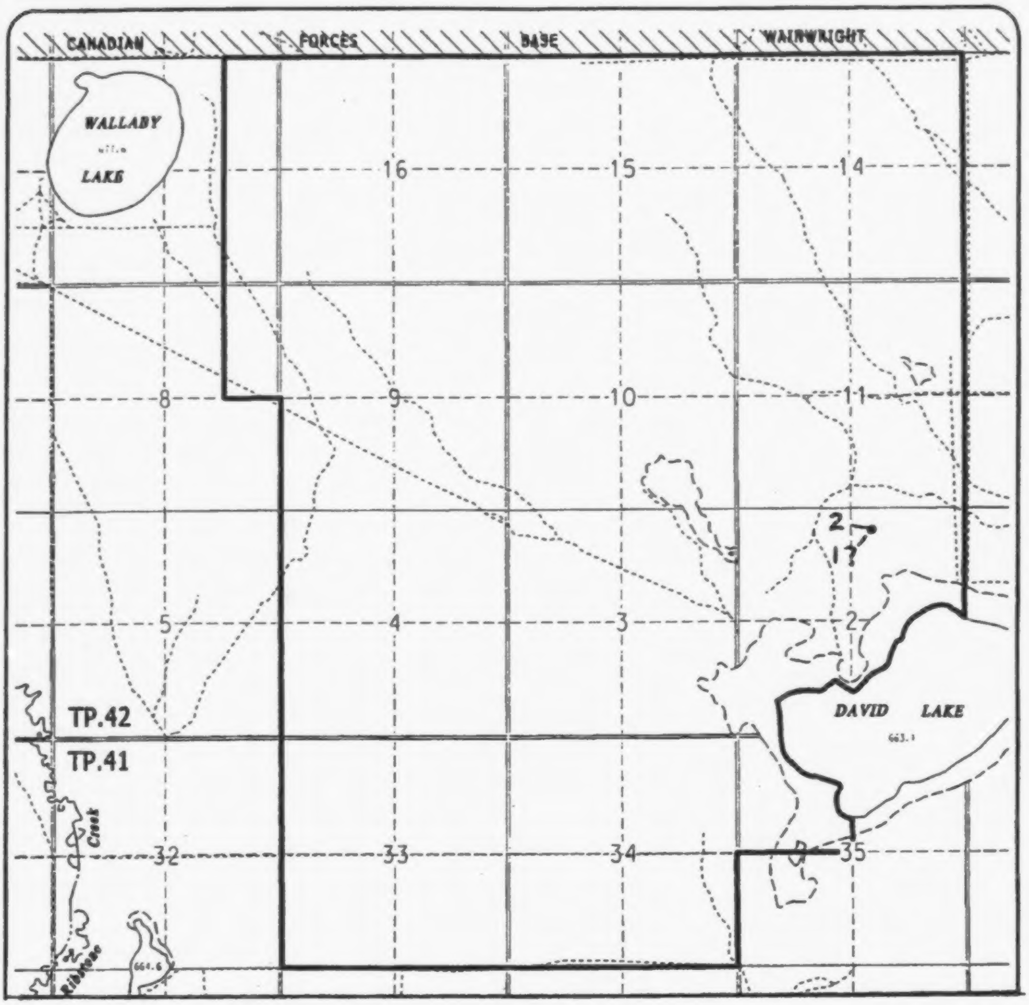
CANADIAN FORCES BASE WAINWRIGHT
WALLABY LAKE
16
15
14
8
9
10
11
2
1?
5
4
3
2
TP.42
TP.41
DAVID LAKE
663.1
32
33
34
35
Creek
Ribstone
664.6

Figure: Location maps and habitat diagrams for *Botrychium multifidum* in the Wainwright Dunes Ecological Reserve

(none)

Photos: Photographs of habitats and plant locations for *Botrychium multifidum* in the Wainwright Dunes Ecological Reserve

(none)

Najas flexilis (Willd.) Rostk. & Schmidt.**—slender naiad—*NAJADACEAE***

This submergent and rooted, annual aquatic herb of pond and stream habitats has a provincial Rank of **S1S2** in Alberta, and a global Rank of **G5** (Vujnovic & Gould 2002, ANHIC 2002). It is the only member of its genus in Alberta, and has a rooted erect stem with many alternating branches, although they often are broken, and with narrow linear leaves in what appear to be whorls of four, that actually are subopposite pairs. It has single, very simple, tiny flowers in the axils of the lower of the subopposite leaf pairs, and single pairs of small, elliptic achenes. The bushy appearance of this species, particularly in late season, allows it to resemble some of the small-leaved *Potamogeton* species, and perhaps even the rare *Elodea bifoliata*. However, it differs from the former in having narrow, serrate leaves that have notably and abruptly broader, clasping bases and no stipules, and from the latter in not having simple opposite leaf pairs (Moss 1983, Fassettt 1957. Muenscher 1972, Voss 1967).

This species occurs across most of North America, is rare in Alberta, Saskatchewan and Prince Edward Island, and in two states, and is may have been extirpated from one state (NatureServe 2003, Kershaw *et al.* 2001). In Alberta it has been recorded from seven locations the Parkland and adjacent southwestern Boreal Natural Regions (ANHIC 2003). The Wainwright Dunes Ecological Reserve appears to be the only known location in the eastern portion of the Parkland Natural Region, and it was first reported in the Ecological Reserve through a collection of A. Fehr in 1983, but was not listed in his list of the Reserve's flora (Fehr 1984). This collection apparently was taken from the large pond on the southeastern side of the Great Fen (ANHIC 2002), about 2.5 km northwest of David Lake. However, the 2002 survey of the reserve did not rediscover any plants in this large pond or in other suitable wetland sites.

There was no information on the number of individuals provided in the collection data for the single known specimen from the reserve.

The wetland habitat of the "beaver pond" that the collection label for this species apparently refers to has experienced considerable drawdown due to the prolonged regional drought conditions between 2000 and 2002. Some standing water still occurred in the central portions of the wetland basin; however, the extent of the exposed barren soils along the drawdown fringe was very great. The survey of the pond area during the 2002 survey discovered several species of *Potamogeton, Potamogeton pectinatus, Potamogeton zosteriformis* (flat-stemmed pondweed) and *Lemna minor* (common duckweed), but little else in the aquatic flora. The species' persistence here may require beaver activity to maintain the dam that keeps the water level high.

The major habitat threat to this species within the reserve is the considerable and long term drawdown situation in the beaver pond basin where it was reported over 20 years ago. The regional drought conditions probably have greatly worsened this situation, and probably also has resulted in the apparent loss of the active beaver population to maintain the dams and ponds.

Management considerations should be to resurvey the beaver pond at the southeastern end of the Great Fen, and the other beaver ponds in the reserve, in hope of rediscovering the species. Such surveys in the mid-summer season should prove more productive if the species still persists. The actual collection location of the known specimen may be in doubt, since, while this may be just a clerical error, the latitude / longitude coordinates on the specimen label indicated a point in the sandland about 2 km due west of David Lake where no pond feature exists. As well, the species was not included in Fehr's otherwise meticulously inclusive general species list for the reserve and its vicinity and was not repeated in the compilation list in the Ecological Reserve's management plan (Anon 1998).

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Najas flexilis* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	not apply
Flood Hazard	not apply
Soil Drainage	very poorly (7)
Perviousness	slowly (3)
Site: Macro	plain (7)
Site: Meso	level (7), depression (6)
Site: Micro	straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	hydric (9)
Nutrients	?permesotrphic (4), ?mesotrophic (3)
Successional Status: 1	pioneer (1)
Successional Status: 2	not apply
Disturbance Factors	draining (8)

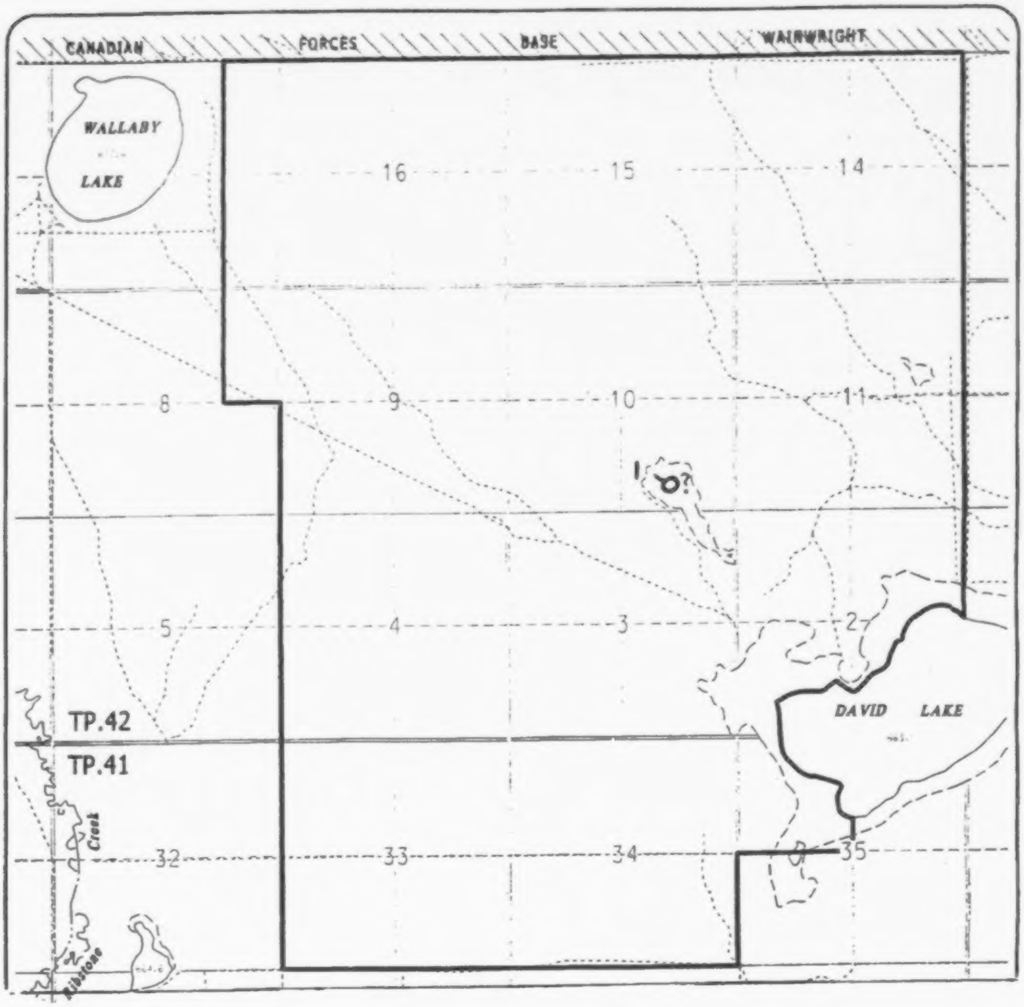
ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	no information
Phenology: reproductive - inflorescence	no information (?June to July)
Phenology: reproductive - flower	no information (?July)
Phenology: reproductive - fruit	no information (?August)
Habitat Threats	pond water level
Management Considerations	refind and monitoring populations

Species location summary for *Najas flexilis* in the Wainwright Dunes Ecological Reserve

map site / date site	location coordinates//	number (size)	habitat
Nf1—Najafle-830727a	UTM27 524700E 5827175N	no information	beaver pond

Map: Species locations for *Najas flexilis* in Wainwright Dunes Ecological Reserve (o indicates approximate reported location)


CANADIAN FORCES BASE WAINWRIGHT
WALLABY LAKE
16
15
14
8
9
10
11
1
o?
5
4
3
2
DAVID LAKE
TP.42
TP.41
Creek
32
33
34
35
Ribstone

PREVIOUSLY REPORTED SPECIES LOCATIONS

map/date site:	Nf1—Najafle-830727a
source:	ANHIC // Element Occurrence PMNAJ01020 # 006
location:	Wainwright Dunes Ecological Reserve // 2 km NW of David Lake // UTM27 524700E 5827175N (250 m) // lat./long.: 52° 35'N / 110° 39'W (on specimen sheet)
reference:	Fehr 1984
observation:	Fehr 27 July 1983
collection:	1983-07-27 // Fehr, A., L. Charbonneau, L. Allen & M. Bailey // PMAE# B86.17.30 // ID-OK // specimen source code S83FEHPMABCA04
photo:	no information
plant numbers:	no information
note:	fruits present (on specimen)
habitat:	"beaver pond" // 670m
comment:	The wetland that this collection probably refers to has been considerably drawn down by the present drought. Standing water still occurred in the central portions of the wetland basin, but the drawdown fringe was very extensive. The species' persistence may require beaver activity to maintain the dam that would keep the water level high. Specimen not inspected by IDM in 2002. Latitude / longitude coordinates on PMAE specimen sheet indicate a location about 2 km west of David Lake, where no pond feature exists.

RECENTLY DISCOVERED SPECIES LOCATIONS

(none)

Figure: Location maps and habitat diagrams for *Najas flexilis* in the Wainwright *Dunes Ecological Reserve*

(none)

Photo: Photographs of habitats and plant locations for *Najas flexilis* in the Wainwright Dunes Ecological Reserve

(none)

Ruppia cirrhosa (Petagna) Grande—**widgeon-grass**—***RUPPIACEAE***

This aquatic herb of saline and alkaline lakes, ponds and ditches has a provincial Rank of **S1S2** in Alberta, and a global Rank of **G5** (Vujnovic & Gould 2002, ANHIC 2002). Its leaves are 5 to 20 cm long and less than 0.5 mm wide in fan-like groups, with sheathing, scarious-margined stipules that are 5 cm to 20 cm long, with very un-*Potamogeton*-like inflorescences consisting of pairs of tiny flowers with no petals and two stamens borne on a spadix from the upper leaf axils, with fruits developing at the tips of four branches in umbel-like clusters atop distinctly coiled culms. While this species is distinctive in its fertile state, it is difficult to differentiate from the similar *Potamogeton pectinatus* in its vegetative state, and may initially also be mistaken for *Potamogeton filiformis* (thread-leaved pondweed). Voss (1967) presented several useful vegetative characteristics to aid in its recognition and to separate it from the genus *Potamogeton*, as follows: sheath with no free ligule at summit, *i.e.*, the stipule wholly adnate to leaf blade, merely rounded at summit (not with a short ligule-like extension of the free stipule at the summit, *i.e.*, the stipule only partly adnate, as in *Potamogeton*); leaf blade terete (not flattened); fruit stalked in an umbel-like arrangement on a spiraled and elongating limp peduncle (not sessile or subsessile in a spike with a straight stiff peduncle). The genus formerly was treated as one species, *Ruppia maritima* L. (formerly called *Ruppia occidentalis* S. Wats.); however, recent taxonomic treatment has restricted that species name to apply to maritime coastal plants, while the name *Ruppia cirrhosa* (formerly called *Ruppia spirillis* L. *ex* Dumort) to apply to continental western North American plants.

This is a circumpolar species that occurs in the western half of North America from the Arctic southward into Central America. It is rare in Alberta, Manitoba and Northwest Territories, and also in two of the western states, and may have been extirpated from one state (NatureServe 2003, Kershaw *et al.* 2001). In Alberta it has been reported from six known locations in the southwestern corner of the Grassland Natural Region and the vicinity of Edmonton in the Parkland Natural Region (ANHIC 2003). Its only reports from the eastern portion of the Parkland Natural Region were those of Fehr (1984) and Cottonwood Consultants, Ltd. (1986) who reported it from the David Lake basin off the eastern side of the peninsula, apparently in the then standing waters of the lake. This species was not relocated during the 2002 survey of the Ecological Reserve. The extensive drawdown conditions in the entire David Lake basin have rendered the site no more than a big salty parking lot. The entire chain of dugout channels in the basin created by Ducks Unlimited were examined, but no water at all remained in them, and while the two larger dugouts in the basin held some water, no aquatic plants of any sort were observed there. Additionally, the dugout along the Reserve's eastern boundary about 1.8 km north of David Lake, and that to the east of the Reserve boundary on the northeastern backshore of David Lake, were surveyed for populations of this species, but none were found.

No information on the number of individuals was available in the several reports for this species' occurrence in the Ecological Reserve, and no plants were relocated during the present survey. It may be that the species has been thoroughly decimated by the drought conditions, and possibly it is even extirpated from the Reserve's flora.

The habitat for this species was indicated by Fehr (1984) to be "submergent" in the then standing waters of David Lake, and the report of Cottonwood Consultants, Ltd. (1986) indicated it to be in "extensive marshes and open water" of the lake, offshore from the central eastern side of the David Lake peninsula. Both of these surveys were conducted in relatively wet years with David Lake being at a high water level. However, the present survey was conducted in a period of extreme drought, and no standing water at all was recorded except in the larger dugouts which had very dark waters from cattle excrement leachate. The relatively cleaner waters of the dugout located along the Reserve's eastern boundary to the northeast of the lake's backshore, and of the several ponds in the interior of the Reserve, did not have this species, although several species of *Potamogeton* were noted, including the similar *Potamogeton pectinatus*, and particular care was taken during the 2002 survey in their determination to ensure that these were not *Ruppia cirrhosa*.

The major habitat threat to this species in the reserve are the prolonged regional drought conditions and with their drawdown effects on the water level in the David Lake marshes where it was originally reported.

Management considerations for this species would entail resurveying the previously known and potential wetland habitats where it previously had been reported during a moister climatic period when David Lake hast higher water levels. Additionally, any vouching specimens should be reexamined and confirmed, since the record was not included by ANHIC (2002) and Kershaw *et al.* (2001) in their mapping for the province. At this time, it appears to be likely that the species has been extirpated from the vascular plant flora of the Ecological Reserve.

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Vujnovic, K. and J. Gould. 2002. Alberta Natural Heritage Information Centre Tracking and Watch Lists – Vascular Plants, Mosses, Liverworts and Hornworts – June 2002. Alberta Community Development, Parks and Protected Areas Division, Edmonton AB.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Ruppia cirrhosa* in the Wainwright Dunes Ecological Reserve

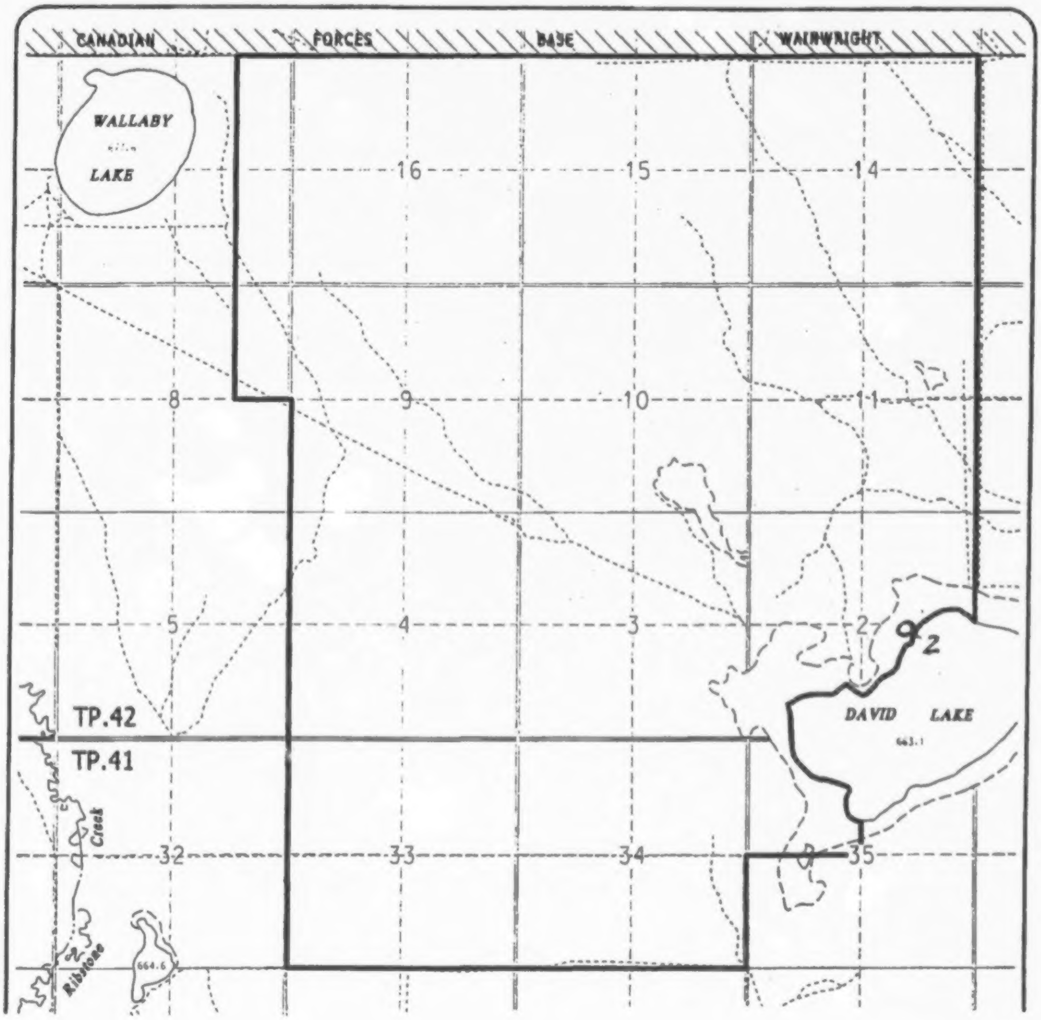
ECOLOGICAL LAND SURVEY SITE DESCRIPTION	
Exposure Type	not apply
Flood Hazard	not apply
Soil Drainage	very poorly (7)
Perviousness	slowly (3)
Site: Macro	plain (7)
Site: Meso	level (7), depression (6)
Site: Micro	straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	hydric (9)
Nutrients	?eutrophic (5), ?hypereutrophic (6)
Successional Status: 1	pioneer (1)
Successional Status: 2	not apply
Disturbance Factors	draining (8)

ANHIC RARE NATIVE PLANT REPORT	
Phenology: vegetative	no information (June to July?)
Phenology: reproductive - inflorescence	no information (June to July?)
Phenology: reproductive - flower	no information (July?)
Phenology: reproductive - fruit	no information (August?)
Habitat Threats	lake water level
Management Considerations	resurvey population habitats, confirm collections

Species location summary for *Ruppia cirrhosa* in the Wainwright Dunes Ecological Reserve

map site / date site	location coordinates	number (size)	habitat
Rc1 - Ruppci-84xxxxa	David Lake (no location)	no information	submergent
Rc2 - Ruppcir-86xxxxa	northern side of David Lake	no information	extensive marshes and open water
Rc3 - Ruppci-90xxxxa	David Lake (no information)	no information	saline lake

Map: Species locations for *Ruppia cirrhosa* in the Wainwright Dunes Ecological Reserve (o indicates approximate reported locations)


CANADIAN FORCES BASE WAINWRIGHT
WALLABY LAKE
16
15
14
8
9
10
11
5
4
3
2
2
DAVID LAKE
TP.42
TP.41
Creek
Ribstone
32
33
34
35
664.6

PREVIOUSLY REPORTED SPECIES LOCATIONS

map/date site: Rc1 – Ruppcir-84xxxxa
location: Wainwright Dunes Ecological Reserve; David Lake
source: Fehr, A. 1984. Appendix 5. Annotated list of the non-vascular and vascular flora of the Wainwright study area, page 90
reference: Fehr, A. 1984. Wainwright Study Area: A Biophysical Inventory. Alberta Energy and Natural Resources.—pages 21 & 40
observation: A. Fehr 1983
collection: no information
photo: no information
plant numbers: no information
note: (this aquatic species is listed in Fehr as its synonym, R. occidentalis); also note that David Lake is completely dried up this summer, although there are two dugouts and drains in the lake basin that still hold some water
habitat: "lake, submergent"
comment: species not relocated during 2002 survey; the dugout to the southwest and the dugout channels to the southwest, northeast and south of the David Lake peninsula were searched; however, the water table was either well below the dugout channel bottoms, or none were seen in the standing water of the larger dugout

map/date site: Rc2 – Ruppcir-86xxxxa
location: northern side of David Lake (see comment below)
source: Cottonwood Consultants, Ltd. 1986.
reference: Cottonwood Consultants, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton.
observation: C. Wallis 1986
collection: no information
photo: no information
plant numbers: no information
note: none
habitat: "extensive marshes and open water of lake"
comment: the Significant Features map of this report located this only generally in the "extensive Marshes and Open Water" along the eastern side of the David Lake peninsula; species not relocated during 2002 survey

map/date site: Rc3 – Ruppcir-90xxxxa
location: northern side of David Lake (see comment below)
source: Wallis 1990
reference: Wallis, C. 1990. Reconnaissance Survey of Saline Wetlands and Springs in the Grassland – Parkland Region of Eastern Alberta. Cottonwood Consultants, Ltd., Calgary and Alberta Lands, Forestry and Wildlife (Natural and Protected Areas), for World Wildlife Fund Canada, and Alberta Forestry, Lands and Wildlife, Prairie for Tomorrow, Edmonton.
observation: C. Wallis 1986
collection: no information
photo: no information
plant numbers: no information
note: none
habitat: "lake"
comment: this relies on the Cottonwood Consultants, Ltd. (1986) Significant Features map; species not relocated during 2002 survey

RECENTLY DISCOVERED SPECIES LOCATIONS

(none)

Figure: Location maps and habitat diagrams for *Ruppia cirrhosa* in the Wainwright Dunes Ecological Reserve

(none)

Photo: Photographs of habitats and plant locations for *Ruppia cirrhosa* in the Wainwright Dunes Ecological Reserve

(none)

Elodea bifoliata St John.—**two-leaved waterweed—H*YDROCHARITACEAE***

This perennial aquatic herb of slough, pond, lake and stream habitats has a provincial Rank of **S1** in Alberta, and a global Rank of **G4G5** (Vujnovic & Gould 2002, ANHIC 2002). This species, which has also been known as *Elodea longivaginata* St. John, is rooted and completely submergent, with branching stems. It has paired leaves that are opposite, about 2.5cm long and 2mm wide and are not crowded in the middle to upper portions of the stem. Its flowers, have three tiny white petals, and are on long stalk-like tubes that extend from the leaf axils to the water surface, and produce a small capsule. It may readily be distinguished from *Elodea canadensis* Michx. (Canada waterweed), which has yet to be confirmed from the province, which has shorter (1.7 cm) and broader (2 to 4 mm) leaves that are in whorls of three and are notably crowded along the middle to upper stems. Additionally it differs from the more eastern *Elodea nuttallii* (Planch.) St. John (Nuttall's waterweed) which also has long, narrow (0.3 to 1.5 mm) leaves that are not crowded, but are in obvious whorls of three (Fassett 1957, Muenscher 1972, Voss 1967). At first glance it may be confused with the rare *Najas flexilis*, but that species has apparent whorls of four leaves (see preceding species summary).

This species occurs in the mid-western North America, is rare in Alberta and Saskatchewan and two northern states, and is considered to have been extirpated from one state (NatureServe 2003, Kershaw *et al.* 2001). It occurs in Alberta at eight known locations in the Grasslands and western Parkland and adjacent southern Boreal Natural Regions (ANHIC 2003). However, it was not mapped from the eastern portion of the Parkland Natural Region in *Rare Vascular Plants of Alberta* (Kershaw *et al.* 2001). Its only report from the Wainwright Dunes Ecological Reserve has been that of Fehr (1984), who listed it as "*Elodea canadensis*" in the general species list, but gave no location and did not include it in any of his community stand data tables. However, if it does occur within the Reserve, his stated habitat would indicate the pond to the southeast of the Great Fen as being one of several likely locations. The reference floral text for Alberta that Fehr probably used when he conducted his survey would have been the then recently published *Flora of Alberta* of Moss (1959) which listed both *Elodea canadensis* and *Elodea nuttallii*, and not the later version of 1983 which listed only *Eleocharis longivaginata* St. John in the province. *Elodea canadensis* is an aquatic species that still has not been confirmed from Alberta, and so his record may well have been an understandably mistaken identification of the rare *Elodea bifoliata*. However, Fehr's record was not repeated in the general accumulative species list that appeared in the Reserve's management plan (Anon 1998) which apparently was edited by several knowledgeable authorities, and who may have excluded the record as being unsubstantiated. The species was not observed during the 2002 survey of the Reserve, and hence its inclusion in its rare flora as based on this record is tentative.
There is no information on the number of individuals of this species within the Ecological

Reserve, and the only likely habitat is "pools in willows and some beaver ponds" (Fehr 1984, Appendix 5), which could imply that is was recorded at several locations and in at least two habitats, although the pond southeast of the Great Fen is more probable. There was no information about associated species in the communities, although there may be several associated species of *Potamogeton* and other aquatics.

The major habitat threats to this species within the Reserve are the prolonged regional drought conditions and their effects on the water level in the beaver pond where it was originally reported. Such habitats were examined during the 2002 survey but no plants were recorded.

Management considerations for this species should include a resurvey during a wetter climatic period of the previously known and potential wetland habitats from which it previously had been reported by Fehr. Additionally, any existing vouching specimens should be found, reexamined and confirmed, since the record was included by neither ANHIC (2002) nor Kershaw *et al.* (2001) in their rare species mapping for the province.

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ANHIC. 2003. Alberta Natural Heritage Information Centre Data Base, searched 28 February, 2003. Alberta Community Development, Parks and Protected Areas Division, Edmonton AB.

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Muenscher, W.C. 1972. *Aquatic Plants of the United States.* Cornell University Press, Ithica and London. x + 374 pp.

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Vujnovic, K. and J. Gould. 2002. Alberta Natural Heritage Information Centre Tracking and Watch Lists – Vascular Plants, Mosses, Liverworts and Hornworts – June 2002. Alberta Community Development, Parks and Protected Areas Division, Edmonton AB.

Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Elodea bifoliata* in the Wainwright Dunes Ecological Reserve

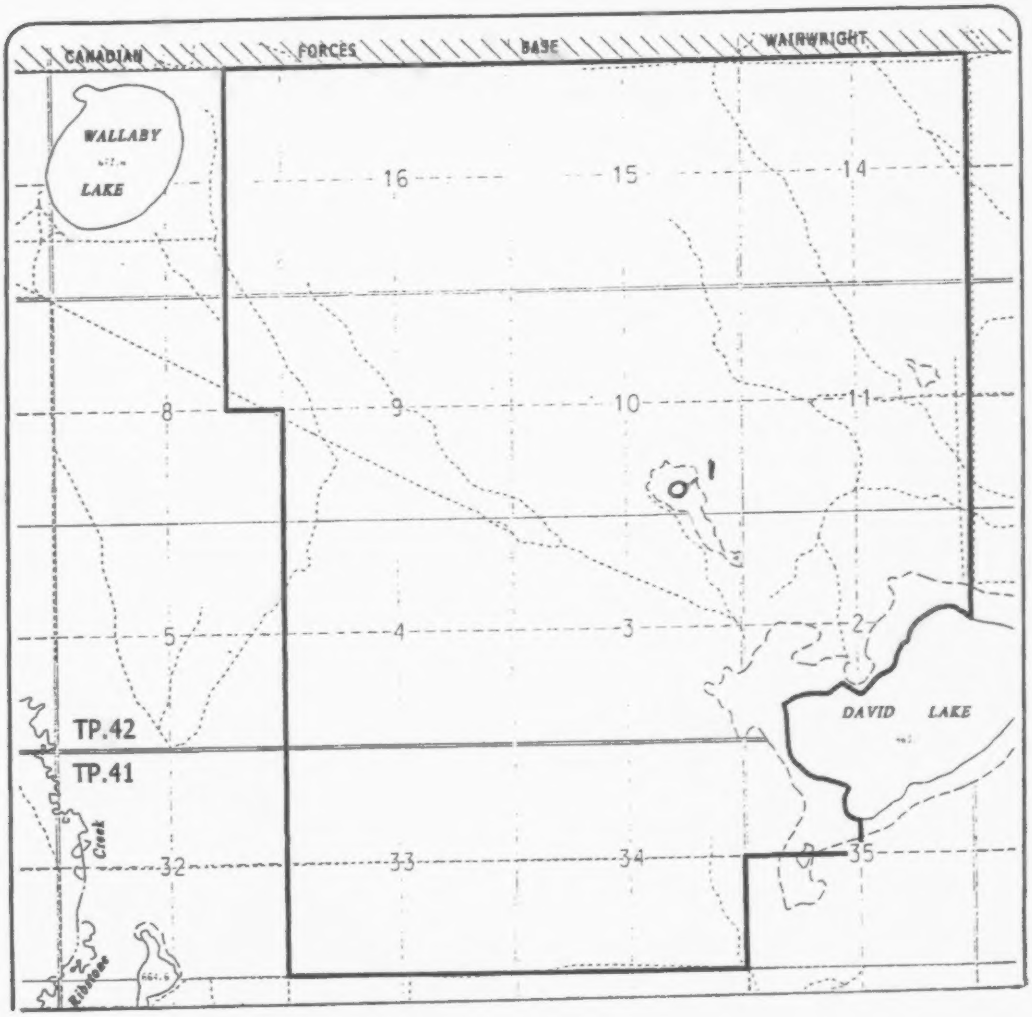
ECOLOGICAL LAND SURVEY SITE DESCRIPTION	
Exposure Type	not apply
Flood Hazard	not apply
Soil Drainage	very poorly (7)
Perviousness	slowly (3)
Site: Macro	plain (7)
Site: Meso	level (7), depression (6)
Site: Micro	straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	hydric (9)
Nutrients ?permesotrphic (4), ?mesotrophic (3)	
Successional Status: 1	pioneer (1)
Successional Status: 2	not apply
Disturbance Factors	draining (8)

ANHIC RARE NATIVE PLANT REPORT	
Phenology: vegetative	no information (?June to July)
Phenology: reproductive – inflorescence	no information (?June to July)
Phenology: reproductive – flower	no information (?July)
Phenology: reproductive – fruit	no information (?August)
Habitat Threats	pond water level
Management Considerations	refind and monitoring populations

Species location summary for *Elodea bifoliata* in the Wainwright Dunes Ecological Reserve

map site / date site	location coordinates	population	habitat
Eb1 – Elodbif-84xxxxa	?beaver pond NW David Lake	no information	thicket? pools, beaver ponds

Map: Species locations for *Elodea bifoliata* in the Wainwright Dunes Ecological Reserve (o indicates tentative approximate reported location)


CANADIAN
FORCES
BASE
WAINWRIGHT
WALLABY
LAKE
16
15
14
8
9
10
11
1
5
4
3
2
DAVID
LAKE
TP.42
TP.41
Creek
32
33
34
35
Ribstone

PREVIOUSLY REPORTED SPECIES LOCATIONS

map/date site: Eb1 – Elodbif-84xxxxa
source: A. Fehr 1983
location: Wainwright Dunes Ecological Reserve (?) // no information
reference: Fehr, A. 1984. Wainwright Study Area: A Biophysical Inventory. Alberta Energy and Natural Resources.
observation: Fehr 1983
collection: no information
photo: no information
plant numbers: no information
note: none
habitat: pools in willows and some beaver ponds
comment: no location information

RECENTLY DISCOVERED SPECIES LOCATIONS

(none)

Figure: Location maps and habitat diagrams for *Elodea bifoliata* in the Wainwright Dunes Ecological Reserve

(none)

Photo: Photographs of habitats and plant locations for *Elodea bifoliata* in the Wainwright Dunes Ecological Reserve

(none)

Muhlenbergia asperifolia (Nees & Meyer *ex* Trin.) Parodi—**scratch grass**—***POACEAE***

This distinctive low grass of moist alkaline soil has a provincial Rank of **S2** in Alberta, and a global Rank of **G5** (Vujnovic & Gould 2002, ANHIC 2002). It is a perennial grass that has a thin, scaled rhizome, with procumbent tips from which arise stems with somewhat keeled leaf sheathes, and a notably diffuse panicle, 4 to 12 cm wide, that is strikingly different from the other *Muhlenbergia* species in the province which have narrow, spike-like inflorescences. Indeed, its overall growth pattern, particularly when the bushy inflorescence is developed, is strongly reminiscent of *Panicum philadelphicum* (woodland witch grass) and *Panicum flexile* (wiry witch grass) of eastern and central North America, or of stunted, low-growing forms of *Panicum capillare* (witch grass), only the last of which also grows in Alberta. However, these other species are annuals, have very different glume sizes, and lack the well-developed overlapping scaled rhizomes that are typical of all species of *Muhlenbergia*. The open panicle has a delicate mauve to light purple colour which makes its presence readily obvious in its habitat, and when dry or mature, they break off from the plant and are blown about to spread their seeds. However, in its preflowering vegetative stages, it looks much like a stunted *Hordeum jubatum* (foxtail barley) and, indeed, probably frequently has been overlooked for this reason; at this stage the presence of rhizomes and lack of hairs on the upper surfaces of the leaf bases would identify the plants as *Muhlenbergia asperifolia* (Moss 1983, Gleason & Cronquist 1991, Fernald 1950).

This species occurs across southern Canada between British Columbia to Ontario (where it is an exotic) and across the United States except in the southern and New England states, and is considered to be rare only in Alberta, but extirpated in New York (NatureServe 2003). In Alberta it has 26 known locations in the Grasslands and eastern Parkland Natural Regions, with two from the general vicinity of the study area (ANHIC 2003). It was first reported from within the Wainwright Dunes Ecological Reserve by Wallis (1990) from the vicinity of the northern shore of David Lake. During the present survey thirteen new locations were discovered within the Ecological Reserve, and four from beyond its boundaries, in four general clusters: 20 to 80 m offshore east of the base of the David Lake peninsula, 10 to 75 m offshore from the southern end of the peninsula; the backshore meadows along the southwestern side of David Lake; and an extensive continuous population along the southeastern to eastern side of the lake.

The number of plants in its locations varied from 50 plants in a 1m X 2 m area with small, local dense to diffuse patches, to an outstanding virtually closed meadow of probably over 3 000 000 plants in a continuous, 150 m X 1 000 m area that extended along the eastern and southeastern offshore of David Lake, but unfortunately, beyond the Ecological Reserve's boundaries. The 2002 survey discovered 72 780 plants within the boundaries of the Reserve, all occurring at 13 locations around the David Lake basin.

The general habitat of this species within the province is "moist alkaline soil" (Moss 1983), and the survey of saline wetlands and springs in the Grasslands and Parkland Natural Regions by Wallis (1900) indicated its occurrence in a "drier community of *Hordeum jubatum, Puccinellia nuttalliana, Distichlis stricta*" (salt grass) north of Medicine Hat (Old Channel Springs Lake), occurring in association with the rare *Aster pauciflorus*, as is the case here. The behaviour of this species in the Ecological Reserve appears to be reliant of the drawdown condition of David Lake that exposes broad expanses of alkaline sandy soil with a mesic to subhygric moisture regime and, perhaps most importantly, a barren substrate to invade, which it does with a vengeance. The most spectacular habitat in the David Lake basin where the species formed a virtually closed short grass meadow occurs along the lake's entire southeastern and eastern sides. Where it occupied a shoreline to offshore zone that was 150 to 200 m wide, and extended for over 1 000 m along virtually the entire length of the shore. Here it formed three related zonal communities: nearshore (where it was at the higher limits of the normal lake level and formed a 20% to 50% meadow cover that was 20 to 50 m wide), farshore (where it joined *Glaux maritima* in forming a 5% to 20% cover as a 50 m wide zone), and offshore (where it formed a 1% to 5% cover in an closed offshore meadow that otherwise was strongly dominated by *Hordeum jubatum*). Off the eastern and southern shores of the David Lake peninsula, this species occurred on alkaline barrens that were more open but of a smaller extent, in effect being local barrens interspersed among the near- and offshore drawdown meadow communities. Here the species presented a variable cover of 2% to 20%, and often was associated with the populations of the rare *Aster pauciflorus* and *Carex parryana*. As well, the species occurred in the more densely developed, closed graminoid meadows that occupied the backshore and nearshore habitats, as in the southwestern side of David Lake. These were dominated by *Calamagrostis stricta, Juncus balticus, Hordeum jubatum* and *Agropyron trachycaulum* subsp. *trachycaulum* (slender wheat grass), and the species presented a 1% to 5% cover and occurred as an undercover species that often was most readily apparent where grazing had removed the taller grass cover. In at least one instance it displayed it ability to act as an invasive species when it occurred on the disturbed sands of the dugout ditch berm just to the east of the peninsula (site Ma11) with *Hordeum jubatum, Agropyron trachycaulum* subsp. *trachycaulum* and several invasive successional species.

As is the case with *Aster pauciflorus*, the main habitat threats to its present condition may well be the reestablishment of the high water levels in David Lake. Presently the plants have successfully invaded the shoreline to offshore zones of the lake basin, and have formed often extensive closed meadows. A return to high water lavels in the basin would drown the present populations. However, there probably is an outstanding seed bank that is produced by the profusely flowering inflorescences, and these seeds are bound to find refuge along the shore, even if as a much narrower zone. The plant appears to be intolerant of prolonged flooding, so the rhizome may not survive as a propagule with prolonged inundation. Grazing by cattle in the meadows of the David Lake basin appeared to have the effect of opening the cover of taller grasses to expose the shorter plants of this species, and perhaps even to 'release' them to present a denser and more vigorous growth. However, the cattle actually did not appear to selectively eat the species, and any impact appeared to be quite incidental.

Management considerations for *Muhlenbergia asperifolia* in the Wainwright Dunes Ecological Reserve should include monitoring the populations in the David Lake basin to determine if there is any grazing impact. Additionally, the northwestern, western and southeastern portions of the David lake basin were not surveyed in 2001, and it is very likely that other populations would also be discovered there with further survey. In moister climatic conditions when the drought conditions cease and the lake water level is restored, further surveying should be conducted to determine changes in the extent of the populations, and to see if the plants appear elsewhere along the shores. Also, a further survey should examine the shores of the Great Fen pond and the other streams and seeps within the reserve; while no populations were discovered in these habitats in 2002, nevertheless, at least small local populations may be expected.

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Muhlenbergia asperifolia* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	not apply
Flood Hazard	may be expected (3)
Soil Drainage	poorly drained (6), imperfectly drained (5), moderately well drained (4)
Perviousness	slowly (3), moderately (2)
Site: Macro	plain (7), valley floor (6)
Site: Meso	level (7), depression (6)
Site: Micro	straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	hygric (7), subhygric (6)
Nutrients	?hypereutrophic (6)
Successional Status: 1	young seral (2)
Successional Status: 2	pioneer (1)
Disturbance Factors	water related (8), grazing (5)

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	mid- to late July, early to mid-August
Phenology: reproductive – inflorescence	mid- to late August
Phenology: reproductive – flower	mid- to late August, early September
Phenology: reproductive – fruit	mid- to late August, early to late September
Habitat Threats	flooding, grazing
Management Considerations	monitoring populations, limiting access

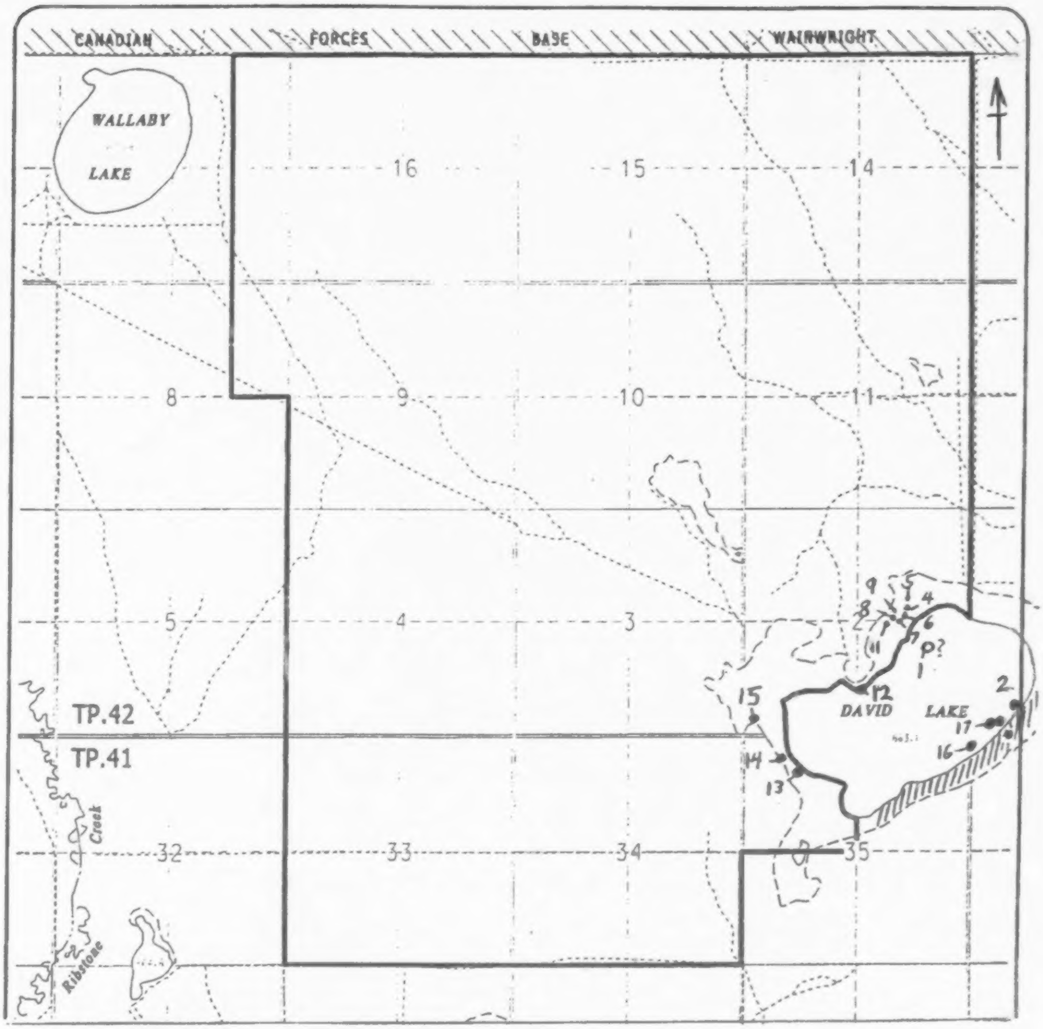
Species location summary for *Muhlenbergia asperifolia* in the Wainwright Dunes Ecological Reserve (+ indicates outside reserve boundaries)

map site / date site	location coordinates	number (size)	habitat
Ma1 – Muhlasp-90xxxxa	UTM27 526500E 5926250N	no information	sandy lake upper shore
+Ma2 – Muhlasp-020815b	52°34.900'N 110°35.885'W	>1 million plants (160 m X 500 m)	drawdown lake near- & offshore alkaline barrens
Ma3 – Muhlasp-020817b-i	52°35.272'N 110°36.653'W	200 (1m X 1.5m)	drawdown lake bed offshore alkaline barrens
Ma4 – Muhlasp-020817b-ii	52°35.265'N 110°36.675'W	>50 (2m X 4m)	drawdown lake bed offshore alkaline barrens
Ma5 – Muhlasp-020817b-iii	52°35.230'N 110°36.695'W	1 500 (5m X 5m)	drawdown lake backshore alkaline seep
Ma6 – Muhlasp-020817b-iv	52°35.227'N 110°36.718'W	50 (1m X 2m)	drawdown lake offshore alkaline barrens
Ma7 – Muhlasp-020817b-v	52°35.236'N 110°36.732'W	400 (1.2m X 3m)	drawdown lake off & nearshore alkaline barrens
Ma8 – Muhlasp-020817b-vi	52°35.250'N 110°36.641'W	300 (1 m X 2 m)	drawdown lake offshore alkaline barrens
Ma9 – Muhlasp-020817c	52°35.248'N 110°36.732'W	2 500 (8m X 40m)	drawdown lake near- & backshore hummocky meadow
Ma10 – Muhlasp-020817d	52°35.243'N 110°36.780'W	50 (35m X 200m)	drawdown lake off- & nearshore hummocky meadow
Ma11 – Muhlasp-020817e	52°35.200'N 110°36.652'W	500 (4m X 6m)	drawdown lakebed channel berm
Ma12 –	52°34.985'N 110°36.910'W	65 000	drawdown lake near- &

map site / date site	location coordinates	number (size)	habitat
Muhlasp-020818b		(50m X 250m)	offshore meadow
Ma13 – Muhlasp-020818f	52°34.645'N 110°37.340'W	1 400 (25m X 25m)	drawdown lake backshore moist meadow
Ma14 – Muhlasp-020818g	52°34.738'N 110°37.452'W	800 (18m X 20m)	drawdown lake near- & backshore meadow
Ma15 – Muhlasp-020818h	52°34.817'N 110°37.587'W	30 (1m X 5m)	drawdown lake offshore meadow
+Ma16 – Muhlasp-020818i	52°34.787'N 110°36.158'W	200 (4m X 6m)	drawdown alkaline lake offshore
+Ma17 – Muhlasp-020818j	52°34.790'N 110°36.114'W	300 (10m X 13m)	drawdown alkaline lake basin
+Ma18 – Muhlasp-020818k	52°34.750'N 110°36.000'W	>2million (150 m X 500 m)	drawdown alkaline lake off- and nearshore meadow

Photo: *Muhlenbergia asperifolia* plant detail: plant habit with inflorescence at early to mid-flowering (Ma2—Muhlasp-020815b - O18, photo Ian D. Macdonald)

Map: Species locations for *Muhlenbergia asperifolia* in the Wainwright Dunes Ecological Reserve (o indicates tentative approximate reported location)


CANADIAN FORCES BASE WAINWRIGHT
WALLABY LAKE
16
15
14
8
9
10
11
5
4
3
2
TP.42
TP.41
32
33
34
35
Ribstone Creek
DAVID LAKE
9
5
4
8
6
7
11
P?
1
12
2
15
14
13
17
16

PREVIOUSLY REPORTED SPECIES LOCATION

map/date site: Ma1 - Muhlasp-90xxxxa
location: Wainwright Dunes Ecological Reserve // David Lake // T41-R5-W4 & T42-R5-W4 // UTM27 526500E 5826250N // see map Ma1
source: ANHIC // Element Occurrence PMPOA48070 # 021
reference: Wallis, C. 1990. Reconnaissance Survey of Saline Wetlands and Springs in the Grassland-Parkland Region of Eastern Alberta. source abstract code U90WAL01ABCA
observation: Wallis., C. 1990. (report implies plants observed on site)
collection: no information
photo: no information
plant numbers: no information
note: protect entire wetland basin with sufficient setback; reduce pressure on wet meadow cts (?) west of David Lake
habitat: lakeshore; drier, upper shore; on sandy soil
comment: this location is in the vicinity of the northern David Lake offshore, probably about 1 km NNE of the peninsula monument, NW2-42-5W4; this species not mapped in Cottonwood 1986

RECENTLY DISCOVERED SPECIES LOCATIONS

map/date site: Ma2 - Muhlasp-020815b
location: adjacent to Wainwright Dunes Ecological Reserve; central eastern side of David Lake, NE of E/W fenceline, 1.2 km ESE of peninsula southern tip; N4-1-42-5W4; see map Ma2
lat./long.: (centre) 52°34.900'N / 110°35.885'W (0.025') (GPS)
UTM27: (centre) 12N 0527100E 5825500N (30m) (map)
collections: 020815a2 (1 replicate @ ALTA / rhizome / leaf: full / inflorescence: young to submature, 15 to 18 cm / flowers: young); 020815b1 (3 replicates @ UAC IDM ALTA / rhizome / leaf: full / inflorescence: semiopen, 12 to 20 cm / flowers: young to mature / fruit / very young)
photos: see also site photos for Aster pauciflorus (020815a); N6 (general habitat: drawdown lake meadow, looking NE) N16 (general habitat: drawdown lake meadow, looking NW, note cattle) O13 O14 O15 O16 O17 O18 (plant detail: plant habit with inflorescence at early to mid-flowering)
plant numbers: estimated over 1 000 000 plants forming a very dense carpet in a 160 m X 500 m area; population extends at least 100 m to NE and over 700 m to SW along the David Lake nearshore (see also 020818k); 60% with inflorescences in mid-flower

note: associated with Aster pauciflorus (020815a) and Carex parryana (020710b 020710c); habitat 1 is immediately adjacent to lake side of thicket fringe which is the high water level of the normal shore level, but now is very dry due to drought drawdown; forms a zone 70 m wide and semicontinuously along shore for over 100 m; none recorded in nearshore or backshore thicket community; habitat 2 extends from 70 m from the thicket fringe for about 60 m to a point about 125 m offshore, and extends NE along shore for over 100 m; it shares this habitat with the rare Aster pauciflorus and Carex parryana; habitat 3 extends from about 125 m offshore from the high shore level thicket as a variable width of 10 to 30 (40) m into the lake's central basin's Hordeum jubatum community, and extends along the offshore to the NE for over 100 m; plants rhizomatous and with bushy inflorescence, like diminutive Horaeum jubatum plants; see mapped figure

habitat 1: drawdown nearshore alkaline barrens of David Lake with semiopen to semiclosed heavily grazed low graminoid meadow of 20-50% **Muhlenbergia asperifolia** - SOIL (alkaline); 5-20% Agropyron trachycaulum subsp. trachycaulum - Agropyron trachycaulum subsp. subsecundum - LITTER; 1-5% Hordeum jubatum - Potentilla anserina - Juncus balticus; <1% Symphoricarpos occidentalis - Cirsium flodmanii - Gentianella amarella - Chenopodium pratericola - Antennaria parvifolia

habitat 2: drawdown offshore alkaline barrens of David Lake with semiopen to semiclosed heavily grazed low graminoid meadow of 5-20% Glaux maritima - SOIL (alkaline) - LITTER - **Muhlenbergia asperifolia**; 1-5% Juncus balticus - Aster pauciflorus - Carex parryana - Hordeum jubatum; <1% Potentilla anserina - Agropyron trachycaulum subsp. subsecundum - Puccinellia nuttalliana - Aster ericoides - Ranunculus cymbalaria - Sonchus arvensis - Scirpus acutus

habitat 3: drawdown offshore alkaline barrens of David Lake with semiclosed to closed lake basin graminoid meadow of 50-75% LITTER; 20-50% Hordeum jubatum; 5-20% Sonchus arvensis; 1-5% SOIL (alkaline) - **Muhlenbergia asperifolia** - Scirpus validus; <1% Glaux maritima - Aster brachyactis

map/date site: Ma3 - Muhlasp-020817b-i

location: Wainwright Dunes Ecological Reserve; David Lake, 700 m NNE of peninsula southern tip, about 35 m off the SW end of the aspen grove on the backshore; NE-2-42-5W4; see map Ma3
lat./long.: (centre) 52°35.272'N / 110°36.653'W (0.025') (GPS)
UTM27: (centre) 12N 0526365E 5826277N (30m) (GPS)

collection: none
photo: none

plant numbers: over 200 plants counted in 1 m X 1.5 m area; plants in mid-flower; forming dense carpet
note: see figure for locations
habitat: drawdown alkaline lake bed (no detailed information recorded)

map/date site: Ma4 - Muhlasp-020817b-ii
location: Wainwright Dunes Ecological Reserve; David Lake, 700 m NNE of peninsula southern tip, about 35 m off the SW end of the aspen grove on the backshore; 10-2-42-5W4; see figure and map Ma4
lat./long.: (centre) 52°35.265'N / 110°36.675'W (0.025') (GPS)
UTM27: (centre) 12N 0526342E 5826265N (30m) (GPS)
collection: none
photo: none
plant numbers: 50 plants counted in 2 m X 4 m area; plants in mid-flower
note: see figure for locations
habitat: drawdown alkaline lake bed (no detailed information recorded)

map/date site: Ma5 - Muhlasp-020817b-iii
location: Wainwright Dunes Ecological Reserve; David Lake, 700 m NNE of peninsula southern tip, about 35 m off the SW end of the aspen grove on the backshore; 10-2-42-5W4; see figure and map Ma5
lat./long.: (centre) 52°35.230'N / 110°36.695'W (0.025') (GPS)
UTM27: (centre) 12N 0526309E 5826200N (30m) (GPS)
collection: 020817b1 (1 replicate @ ALTA / rhizome / leaf: full / inflorescence: early to full, 5 to 12 cm / flowers: young to mature / fruit: young
photo: N22 (general habitat: drawdown lake nearshore meadow, pink flags mark plant location boundary)
plant numbers: over 1 500 plants counted in 5 m X 5 m area; 20% population in mid-flower; forming dense carpets
note: associated with Aster pauciflorus (see 020817a); see figure for locations
habitat: David Lake backshore moist meadow, some seepage evident, with semiclosed graminoid meadow of 20-50% LITTER - SOIL (alkaline) - **Muhlenbergia asperifolia** - Glaux maritima; 5-20% Potentilla anserina - Hordeum jubatum; 1-5% Agropyron trachycaulum subsp. subsecundum - Juncus balticus; <1% Aster pauciflorus

map/date site: Ma6 - Muhlasp-020817b-iv
location: Wainwright Dunes Ecological Reserve; David Lake, 700 m NNE of peninsula southern tip, about 35 m off the SW end of the aspen grove on the backshore; 10-2-42-5W4; see figure and map Ma6
lat./long.: (centre) 52°35.227'N / 110°36.718'W (0.025') (GPS)

UTM27: (centre) 12N 0526289E 5826195N (30m) (GPS)
collection: none
photo: none
plant numbers: 50 plants counted in 1 m X 2 m area
note: grazed area; does cattle grazing remove the tall cover of the Agropyron trachycaulum and Hordeum jubatum, and thus expose the Muhlenbergia asperifolia as undercover that then greatly increases its cover to become dominant; see figure for locations
habitat drawdown alkaline lake bed offshore meadow (no detailed information recorded)

map/date site: Ma7 - Muhlasp-020817b-v
location: Wainwright Dunes Ecological Reserve; David Lake, 700 m NNE of peninsula southern tip, about 35 m off the SW end of the aspen grove on the backshore; 10-2-42-5W4; see figure and map Ma7
lat./long.: (centre) 52°35.236'N / 110°36.732'W (0.025') (GPS)
UTM27: (centre) 12N 0526274E 5826212N (30m) (GPS)
collection: none
photo: none
plant numbers: 400 plants counted in 1.2 m X 3 m area; 15% in mid-flowering inflorescences
note: none
habitat drawdown alkaline lake bed offshore meadow (no detailed information recorded)

map/date site: Ma8 - Muhlasp-020817b-vi
location: Wainwright Dunes Ecological Reserve; David Lake, 700 km NNE of peninsula southern tip, about 35 m off the SW end of the aspen grove on the backshore; 10-2-42-5W4; see figure and map Ma8
lat./long.: (centre) 52°35.250'N / 110°36.641'W (0.025') (GPS)
UTM27: (centre) 12N 0526377E 5826227N (30m) (GPS)
collection: none
photo: none
plant numbers: 300 plants counted in 1 m X 2 m area
note: none
habitat drawdown alkaline lake bed (no detailed information recorded)

map/date site: Ma9 - Muhlasp-020817c
location: Wainwright Dunes Ecological Reserve; David Lake, 100 m SE of peninsula southern tip, just off shore from the SW third of the aspen grove; SW7-2-42-5W4; see figure and map Ma9

lat./long.: (centre) 52°35.248'N / 110°36.732'W (0.025') (GPS)
UTM27: (centre) 12N 0526206E 5826234N (30m) (GPS)

collection: none

photos: N23 (general habitat: drawdown lake nearshore, looking NE) N24 (habitat detail: drawdown lake nearshore)

plant numbers: approximately 2 500 plants counted in 8 m X 40 m area; 20% in mature inflorescence; plants extend ca 35 m to NE and SW from centre as nearshore fringe 5 m to 12 m wide and 70 m long

note: zoning sequence from backshore toward lake centre is Aspen grove, then low thickets of Symphoricarpos occidentalis - Elaeagnus commutata, then dry short grassland with Antennaria parvifolia, then this zone; separated from low thicket by 5 m - 8 m

habitat: drawdown lake nearshore and backshore shortgrass meadow of 50-75% **Muhlenbergia asperifolia** - LITTER; 5-20% Antennaria parvifolia; 1-5% SOIL (alkaline) - Muhlenbergia richardsonii - Agropyron trachycaulum subsp. subsecundum - Juncus balticus - Carex scirpoidea - Hordeum jubatum - Potentilla anserina - Cirsium flodmanii - Juniperus horizontalis - Aster brachyactis - Glaux maritima; <1% Equisetum variegatum - Aster ericoides - Potentilla pensylvanica - Symphoricarpos occidentalis - Descurania sophia - Anemone multifida

map/date site: Ma10 - Muhlasp-020817d

location: Wainwright Dunes Ecological Reserve; David Lake, NW shore, 100 m SE of peninsula southern tip; SW7-2-42-5W4; see map Ma10
lat./long.: (centre) 52°35.243'N / 110°36.780'W (0.025') (GPS)
UTM27: (centre) 12N 0526322E 5826288N (30m) (map)

collection: none

photo: N25 (general habitat; see Carex parryana for photo)

plant numbers: over 50 counted plants in 35 m X 200 m area

note: associated with Carex parryana (020817d)

habitat: drawdown lake offshore and nearshore hummocky alklaine barren with closed shortgrass meadow of 20-50% Potentilla anserina - Agropyron trachycaulum subsp. subsecundum - LITTER; 5-20% Juncus balticus; 1-5% SOIL (alkaline) - Glaux maritima - **Muhlenbergia asperifolia** - Antennaria parvifolia - Hordeum jubatum; <1% Muhlenbergia richardsonii - Agrostis scabra - Solidago canadensis - Senecio pauperculus - Symphoricarpos occidentalis - Aster ericoides - Potentilla pensylvanica - Gentianella amarella - Cirsium flodmanii

map/date site: Ma11 - Muhlasp-020817e

location: Wainwright Dunes Ecological Reserve; David Lake, NW offshore along

dugout berms for duck habitat improvement; this is the fifth berm pile SW of the bend in the line of berms, 500 m NE of peninsula southern tip; 7NE-2-42-5W4; see figure and map Ma11
lat./long.: (centre) 52°35.200'N / 110°36.652'W (0.025') (GPS)
UTM27: (centre) 12N 0526365E 5826145N (30m) (map)

collection: none

photo: P3 (general habitat: drawdown lake bed dugout channel berm, Muhlenbergia to left, channel to right)

plant numbers: 500 plants counted in 4 m X 6 m area; 40% in full inflorescence at early to mid-anthesis

note: species acting as initial successional plant here

habitat: berm of drainage channel offshore in drawdown lake bed in association with Hordeum jubatum – Agropyron trachycaulum subsp. trachycaulum – Taraxacum officinale – Sonchus arvensis – Agropyron repens (general survey only)

map/date site: Ma12 – Muhlasp-020818b

location: Wainwright Dunes Ecological Reserve; David Lake, 150 m S of peninsula southern tip; NW2&NE3-2-42-5W4; see figure and map Ma12
lat./long.: (centre) 52°34.985'N / 110°36.910'W (between NE end 52°35.005'N / 110°36.855'W and SW end 52°34.968'N / 110°36.961'W) (0.025') (GPS)
UTM27: (centre) 12N 0526075E 5825400N (between NE end 12N 0526137E 5825282N and SW end 12N 0526010E 5825700N) (30m) (GPS)

collection: 020818b1 (2 replicates @ IDM ALTA / rhizome / leaf: full / inflorescence: full, 10 to 15 cm / flower: early to mature / fruit: young to mature)

photos: P9 (general habitat: drawdown lake offshore alkaline flats, note cattle grazing, pink flags mark plant boundary) P10 (detail habitat: drawdown lake offshore alkaline flats) P11 (habitat detail: drawdown lake offshore alkaline Juncus meadow, pink flags mark plant boundary) P12 (habitat detail: drawdown lake alkaline offshore openings in Juncus sward) P13 (general habitat: drawdown lake shoreline meadow, pink flags mark plant locations) P14 (habitat detail: drawdown lake shoreline meadow) P15 (general habitat: drawdown lake offshore Juncus sward, note grazed swaths, pink flags mark population) P16 (general habitat: drawdown lake offshore Juncus sward, pink flags marks plant location)

plant numbers: 65 000 plants in 50 m X 250 m area (estimate based on counts in several 10m X 10m areas)

note: associated with Aster pauciflorus (020818a) and Carex parryana (020818c); does not appear to extend onto the upland grassland above the high lake level shoreline; does extend somewhat into the lake basin's offshore Juncus - Hordeum community; habitat 1 presents presence of Antennaria parvifolia and has grazed swaths in 20% of the surface area and grazing to 10% of height (i.e., 90% gone); habitat 4 extends 30 m into the sward, beyond this to 20 m to 30 m in the lake basin's Hordeum meadow zone where it has rather sporadic occurrence, almost an edge effect; fairly consistently evident in grazed swaths and openings in the Juncus - Scirpus swards, but not evident where this year's growth has not been grazed; does the grazing release the over-cover of Juncus, and the Muhlenbergia becomes more evident, or is this actually an increasing population?

habitat 1: drawdown lake shoreline and nearshore, level (3° E to SE slope) submesic (formerly subhygric) alkaline sand with grazed closed to semiclosed graminoid nearshore meadow of 5-20% **Muhlenbergia asperifolia** - LITTER - Antennaria parvifolia - SOIL (alkaline sand); 1-5% Potentilla anserina - Scirpus pungens - Juncus balticus - Sonchus uliginosus - Agropyron trachycaulum subsp. trachycaulum - Glaux maritima - Solidago canadensis var. canadensis - Carex parryana - Cirsium flodmanii - MOSS; <1% Aster ericoides - Potentilla pensylvanica - Poa pratensis var. pratensis - Aster pauciflorus - Symphoricarpos occidentalis - Koeleria macrantha - Agropyron trachycaulum subsp. subsecundum - Cirsium arvense - Cerastium arvense - Deschampsia caespitosa - Distichlis stricta - Rosa acicularis - Carex ?obtusata - Plantago major - Fragaria virginiana

habitat 2: drawdown lake nearshore sandy exposures open alkaline barrens with graminoid meadow of 20-50% SOIL (alkaline sand); 5-20% **Muhlenbergia asperifolia** - LITTER; 1-5% Scirpus pungens - Antennaria parvifolia - Glaux maritima - Aster pauciflorus - Aster ericoides - Sonchus arvensis - Distichlis stricta - Juncus balticus; <1% Carex parryana - Elymus trachycaulum subsp. trachycaulum - Cirsium flodmanii - Agropyron trachycaulum subsp. subsecundum - Potentilla anserina - Solidago canadensis

habitat 3: drawdown lake nearshore with extremely open alkaline barrens of >75% SOIL (alkaline sand); 5-20% Glaux maritima; 1-5% LITTER - **Muhlenbergia asperifolia** - Sonchus arvensis - Aster pauciflorus - Aster ericoides - Juncus balticus - Hordeum jubatum- Scirpus pungens - Ranunculus cymbalaria - Agropyron trachycaulum subsp. subsecundum - Potentilla anserina; <1% Puccinellia nuttalliana

habitat 4: drawdown lake offshore alkaline sand with grazed openings in Juncus balticus sward having semiclosed to closed graminoid meadow of 20-50% Juncus balticus; 5-20% LITTER - Glaux maritima; 1-5% SAND - **Muhlenbergia asperifolia** - Sonchus arvensis - Potentilla anserina; <1%

Deschampsia caespitosa – Ranunculus cymbalaria – Aster ericoides – Scirpus pungens – Aster pauciflorus – Carex pratericola

map/date site: Ma13 – Muhlasp-020818f

location: Wainwright Dunes Ecological Reserve; south end of David Lake, 800 m SW of peninsula southern tip; NW14-35-41-5W4; see figure and map Ma13

lat./long.: (centre) 52°34.645'N / 110°37.340'W (east end 52°34.624'N / 110°37.320'W; west end 52°34.672'N / 110°37.360'W) (0.025') (GPS)

UTM27: (centre) 12N 0525610E 5825120N (east end 12N 0525625E 5825086N; west end 12N 0525570E 5825162N) (30m) (GPS)

collection: 020818f1 (1 replicate @ ALTA / rhizome / leaf: full / inflorescence: full, 20 cm, abscissing / flower: mature / fruit: young

photo: P19 (general habitat: drawdown lake backshore graminoid meadow, looking SW; flags at the plant locations)

plant numbers: 1 400 plants counted in 25 m X 120 m area in 2 clusters: 1 100 counted in 25 m X 25 m (habitat 1) and 300 counted in 10 m X 25 m (habitat 2); the western end has the larger plant concentration; 90% of plants in full inflorescence

note: photo P19 (population and fence, flags at the plant locations); grazed to 20% of former height over 40% surface area

habitat 1: David Lake backshore moist meadow, some seepage evident, closed graminoid meadow of 5–20% Agropyron trachycaulum subsp. trachycaulum – Glaux maritima; 1–5% LITTER – **Muhlenbergia asperifolia** – Puccinellia nuttalliana – Juncus balticus – Potentilla anserina – Agropyron trachycaulum subsp. subsecundum – Scirpus acutus – Calamagrostis inexpansa – Sonchus uliginosus – Scirpus validus; <1% Aster brachyactis – Scirpus pungens – Hordeum jubatum – Puccinellia nuttalliana

habitat 2: David Lake backshore moist meadow, some seepage evident, with closed graminoid meadow of 20–50% Hordeum jubatum – Glaux maritima; 5–20% Agropyron trachycaulum subsp. trachycaulum; 1–5% Puccinellia nuttalliana – **Muhlenbergia asperifolia** – LITTER – Agropyron trachycaulum subsp. subsecundum – Potentilla anserina – Scirpus acutus – Calamagrostis inexpansa – Juncus balticus – Sonchus arvensis; <1% SOIL – Cirsium flodmanii – Ranunculus cymbalaria – Triglochin maritima

map/date site: Ma14 – Muhlasp-020818g

location: Wainwright Dunes Ecological Reserve; southwestern end of David Lake, 800 m SW of peninsula southern tip; NW13-35-41-5W4; see figure and map Ma14

lat./long.: (centre) 52°34.738'N / 110°37.452'W (0.025') (GPS)
UTM27: (centre) 12N 0525466E 5825274N (30m) (GPS)

collection: none
photo: none
plant numbers: 800 plants counted in 18 m X 20 m area; habitat 1 has 40 plants, habitat 2 has over 750 plants
note: subhygric, now submesic due to drought and lake drawdown
habitat 1: drawdown lake flat and level submesic (normally subhygric) backshore and nearshore with ungrazed grassy meadow of 20-50% LITTER - Calamagrostis stricta; 5-20% Juncus balticus; 1-5% Potentilla anserina - **Muhlenbergia asperifolia** - Calamagrostis inexpansa - Antennaria parvifolia; <1% Agropyron trachycaulum subsp. trachycaulum - Symphoricarpos occidentalis - SOIL (sand)
habitat 2: drawdown lake backshore and nearshore meadow with grazed grassy meadow of 20-50% LITTER; 5-20% Juncus balticus - Antennaria parvifolia - Calamagrostis stricta; 1-5% **Muhlenbergia asperifolia** - Poa ?pratensis - SOIL - Agropyron trachycaulum subsp. trachycaulum - Oxytropis sericea; <1% Symphoricarpos occidentalis

map/date site: Ma15 - Muhlasp-020818h
location: Wainwright Dunes Ecological Reserve; southwestern side of David Lake, 700 m WSW of peninsula southern tip; SW4-2-42-5W4; see figure and map Ma15
lat./long.: (centre) 52°34.817'N / 110°37.587'W (0.025') (GPS)
UTM27: (centre) 12N 0525319E 5825431N (30m) (GPS)
collection: none
photo: none
plant numbers: 30 plants counted in 1 m X 5 m area
note: none
habitat: drawdown lake offshore meadow fringe of subhygric lake edge grazed marsh of Agropyron trachycaulum subsp. trachycaulum - Juncus balticus forming semiopen graminoid meadow of 20-50% LITTER; 5-20% SOIL - Agropyron trachycaulum subsp. trachycaulum; 1-5% Juncus balticus - Potentilla anserina - **Muhlenbergia asperifolia** - Cirsium flodmanii - Symphoricarpos occidentalis; <1% Descurania sophia
map/date site: Ma16 - Muhlasp-020818i
location: adjacent to Wainwright Dunes Ecological Reserve; east central David Lake basin, 1 km ESE of peninsula southern tip; NE13-36-41-5W4; see map Ma16
lat./long.: (centre) 52°34.787'N / 110°36.158'W (0.025') (GPS)
UTM27: (centre) 12N 0526934E 5825386N (30m) (GPS)

collection: none
photo: none
plant numbers: 200 plants counted in 4 m X 6 m area, and probably more
note: cattle grazed area exposes the understory, hence the Muhlenbergia asperifolia is notably evident
habitat: drawdown lake basin offshore alkaline sand with closed short grass meadow of >75% Hordeum jubatum; 5-20% LITTER - Glaux maritimus - Scirpus validus - Taraxacum officinale; 1-5% **Muhlenbergia asperifolia** - Puccinellia nuttalliana - Sonchus arvensis

map/date site: Ma17 - Muhlasp-020818j
location: adjacent to Wainwright Dunes Ecological Reserve; east central offshore of David Lake basin, 1 km ESE of peninsula southern tip; NE13-36-41-5W4; see map Ma17
lat./long.: (centre) 52°34.790'N / 110°36.114'W (0.025') (GPS)
UTM27: (centre) 12N 0526975E 5825388N (30m) (GPS)
collection: none
photo: none
plant numbers: 300 plants counted in 10 m X 13 m area
note: none
habitat: drawdown lake basin alkaline soil with closed graminoid meadow of 50-75% Hordeum jubatum; 5-20% LITTER; 1-5% Glaux maritima - Scirpus validus - Taraxacum officinale; <1% **Muhlenbergia asperifolia** - Puccinellia nuttalliana - Sonchus arvensis
map/date site: Ma18 - Muhlasp-020818k
location: adjacent to Wainwright Dunes Ecological Reserve; SE shore of David Lake, 1.2 km ESE of David Lake peninsula southern tip; 16-35-41-5W4, 13-36-41W4; see map Ma18
lat./long.: (centre) 52°34.750'N / 110°36.000'W (0.025') (map)
UTM27: (centre) 12N 0526750E 5825200N (30m) (map)
collection: 020818k1 (3 replicates @ UAC PP-4875 / rhizome / leaf: full / inflorescence: full, 20 cm / flower: mature / fruit: young)
photo: none
plant numbers: over 2 000 000 plants estimated in 150 m X 500 m area, extending along the southeastern near- and offshore of David Lake
note: population extends to NE along the David Lake near- and offshore; representative densities per 1 m X 1 m are 72, 140, 170, 180, 165, 180 plants, and forming an apparently continuous cover
habitat: drawdown lake near and offshore alkaline sand barrens with closed short grass meadow of 20-50% **Muhlenbergia asperifolia** - LITTER; 5-20% Glaux maritima - Potentilla anserina; 1-5% Agropyron trachycaulum subsp.

subsecundum - Hordeum jubatum - Scirpus acutus; <1% Antennaria parvifolia - Distichlis stricta var. stricta - Gentianella amarella

Photos: Photographs of habitats and species locations for *Muhlenbergia asperifolia* in the Wainwright Dunes Ecological Reserve (see compilation volume)

- Ma2—Muhlasp-020815b
  - N6 (general habitat: drawdown lake meadow, looking NE)
  - N16 (general habitat: drawdown lake meadow, looking NW, note cattle)
  - O13 (plant detail: plant habit with inflorescence at early to mid-flowering)
  - O14 (plant detail: plant habit with inflorescence at early to mid-flowering)
  - O15 (plant detail: plant habit with inflorescence at early to mid-flowering)
  - O16 (plant detail: plant habit with inflorescence at early to mid-flowering)
  - O17 (plant detail: plant habit with inflorescence at early to mid-flowering)
  - O18 (plant detail: plant habit with inflorescence at early to mid-flowering)

- Ma5—Muhlasp-020817b-iii
  - N22 (general habitat: drawdown lake nearshore meadow, pink flags mark population boundary)

- Ma9—Muhlasp-020817c
  - N23 (general habitat: drawdown lake nearshore, looking NE)
  - N24 (habitat detail: drawdown lake nearshore)

- Ma10—Muhlasp-020817d
  - N25 (see Carex parryana photos, general habitat: drawdown lake nearshore hummock terrain)

- Ma11—Muhlasp-020817e
  - P3 (general habitat: drawdown lake bed dugout channel berm, Muhlenbergia to left, channel to right)

- Ma12—Muhlasp-020818b
  - P9 (general habitat: drawdown lake offshore alkaline flats, note cattle grazing, pink flags mark plant location boundary)
  - P10 (detail habitat: drawdown lake offshore alkaline flats)
  - P11 (habitat detail: drawdown lake offshore alkaline Juncus meadow, pink flags mark population boundary)
  - P12 (habitat detail: drawdown lake alkaline offshore openings in Juncus sward)
  - P13 (general habitat: drawdown lake shoreline meadow, pink flags mark plants

concentrations)

  - P14 (habitat detail: drawdown lake shoreline meadow, scale to ruler)
  - P15 (general habitat: drawdown lake offshore Juncus sward, note grazed swaths, pink flags mark plant location boundary)
  - P16 (general habitat: drawdown lake offshore Juncus sward, pink flags marks plant boundary)

- Ma13—Muhlasp-020818f
  - P19 (general habitat: drawdown lake backshore graminoid meadow, looking SW, pink flags at the plant locations)

Carex crawei **Dewey—Crawe's sedge—*CYPERACEAE***

This low to medium height lowland sedge has a provincial Rank of **S2** in Alberta, and a global Rank of **G5** (Vujnovic & Gould 2002, ANHIC 2002). It is a perennial graminoid, with well-developed rhizomes, and has persisting clusters of the previous year's leaf bases. It has a single terminal staminate spike that is well-separated from the two to three sessile pistillate spikes, and has leaf-like bracts along the stem. The perigynia are glabrous and have three stigmata that develop from green when young to beige with small reddish glandular dots on its surface when mature, with light reddish-brown hyaline scales. A first glance, the species resembles small plants of *Carex lanuginosa* or others of the Section *Hirtae*, except that the perigynia are glabrous, not densely if minutely hiruste. Contrary to the comparisons indicated in *Rare Vascular Plants of Alberta* (Kershaw *et al.* 2001), the specimens located during this survey did not at all bear any resemblance to *Carex aurea*, which is a much more delicate plant with orange globose perigynia. Its closest resemblance is to *Carex granularis* which extends from the east only as far as Saskatchewan, and rather has its staminate spike immediately proximate to the pistillate spikes.

This widespread Northern American species occurs in all the provinces except Nova Scotia and is rare in four other provinces, including Saskatchewan and New Brunswick, and possibly as an extirpated species in British Columbia and Newfoundland-Labrador. As well, it occurs in over two-thirds of the United States and is rare in 13 states, and extirpated from two states (NatureServe 2003, Kershaw *et al.* 2001). It has a very limited occurrence in Alberta with 13 known locations in the northern and central Rocky Mountain, northeastern Grassland and eastern Parkland Natural Regions (ANHIC 2003), with its nearest location less than 25 km from the study area, on the low border of Rough Lake, southeast of Wainwright, collected by K.E. Tannas in 1978 (ANHIC 2002, 2003; Moss 1983). Within the Wainwright Dunes Ecological Reserve, it was first reported by Cottonwood Consultants, Ltd. (1986) from the Great Fen basin and from the northwestern end of the large pond near it. In 1992, Derek Johnson and Patsy Cotterill, and again in 2001, Patsy Cotterill and Margaret Meijer reported five locations about 300 m north of the David Lake shore. During the present survey, however, it was found only once, unfortunately just 175 m east of the eastern boundary of the Reserve, again in the backshore zone along the north shore of David Lake. Searches in the previously reported locations or in potentially suitable habitats within the study area did not rediscover any additional individuals of this species.

The previous records of Cotterill and Meijer (2001) indicated that "hundreds" of plants of this species were located along the aspen grove on the north side of David Lake. However, searches during the 2002 survey did not rediscover any plants in the backshore grove or tall thicket habitats. However, the current study did discover a small population from the northern backshore of David Lake, but just outside the Ecological Reserve's eastern boundary, with 13 plants occurring in a tight 0.4 m X 0.7 m cluster, and with most of the plants presenting a developing inflorescence that by early July had at least young fruits that were well on their way to maturing. Since the population was beyond the Reserve's formal study area, only a portion of the potential habitat could be surveyed; there is potential, however, for "hundreds" to occur at that location.

The habitat conditions for the species across the province generally appear to be "calcareous meadows" (Kershaw *et al.* 2001, Moss 1983). Within the Reserve they were reported to include a patterned fen in the "extensive beaverpond and fen complex" at the Great Fen, about 2 km northwest of David Lake, and from an "imperfectly drained edge of an aspen grove" near the lake's northern backshore (ANHIC 2002). The populations that were discovered during the 2002 survey occurred in a subhygric seepage backshore semiopen tall thicket of *Salix pseudomonticola, Betula occidentalis, Carex lanuginosa, Juncus balticus* and *Crepis runcinata* (scapose hawk's-beard), in association with other calcareous seepage habitat herb cover species of *Carex aurea* (golden sedge), *Carex viridula, Eleocharis quinqueflora, Primula incana, Senecio pauperculus, Deschampsia cespitosa,* and notably with the rare *Gentiana fremontii.*

Habitat threats to the plants occurring here may be related to the prolonged drought conditions between 2000 and 2002 around the wetlands and lake basin. It is apparent that the subsurface seepage flow along the northern backshore of David Lake has been reduced and what now are subhygric moisture regimes probably were in the past at least hygric in moisture climatic conditions. Prolonged drought may induce the invasion and establishment of a more closed shrub cover that may affect the plants. The Great Fen complex currently still has standing water, but evidently not as much as when the species was originally found here, and searches in 2002 did not rediscover the species there. In the case of the population occurring east of the reserve, a conversation with the local rancher, Hilson Maull, indicated that the entire thicket complex along the north shore of David Lake outside the Reserve boundaries was under forest cover to the mid 1990s, but was cut and brushed out to improve grazing capability. This activity must have influenced the present thicket community which is still relatively rich in fen species, including two rare plant species, Carex crawei and Gentiana fremontii. The cattle grazing pattern in the area outside the Reserve boundaries occurred as grazing corridors only a meter or so wide that meander through the community. As well, the cattle use the thicket as a movement corridor at this location, creating several well-worn, east to west trails, with only minor grazing along their immediate margins. Within the Reserve boundaries, no grazing was noted in the Great Fen area, but it was present at a light intensity in the thickets north of the lake.

Management concerns should include monitoring the recently discovered population and attempting to rediscover the previously reported populations, perhaps in moister climatic conditions. It is likely that additional populations occur in suitable seepage and fen-like wetland situations not only along the northern end of the lake, but also along its southern and western sides. An investigation of the reported cutting of the backshore forest for grazing improvement should be undertaken to determine its extent and dates, and whether this activity has damaged or actually improved the habitat for this and the rare gentian species. Since the prolonged drawdown of the water table and lake level probably will advance the invasion of more mesic species into the habitats, any future monitoring should identify the extent of this potential impact.

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Carex crawei* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	frost (4)
Flood Hazard	none
Soil Drainage	imperfectly drained (5), poorly drained (6)
Perviousness	moderately (2)
Site: Macro	plain (7), valley floor (6)
Site: Meso	level (7)
Site: Micro	straight (1), hummocks (2)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	subhygric (6), hygric (7)
Nutrients	?permesotrophic (4)
Successional Status: 1	young seral (2)
Successional Status: 2	not apply
Disturbance Factors	site improvement (7), water related (8), grazing (5)

ANHIC RARE NATIVE PLANT REPORT

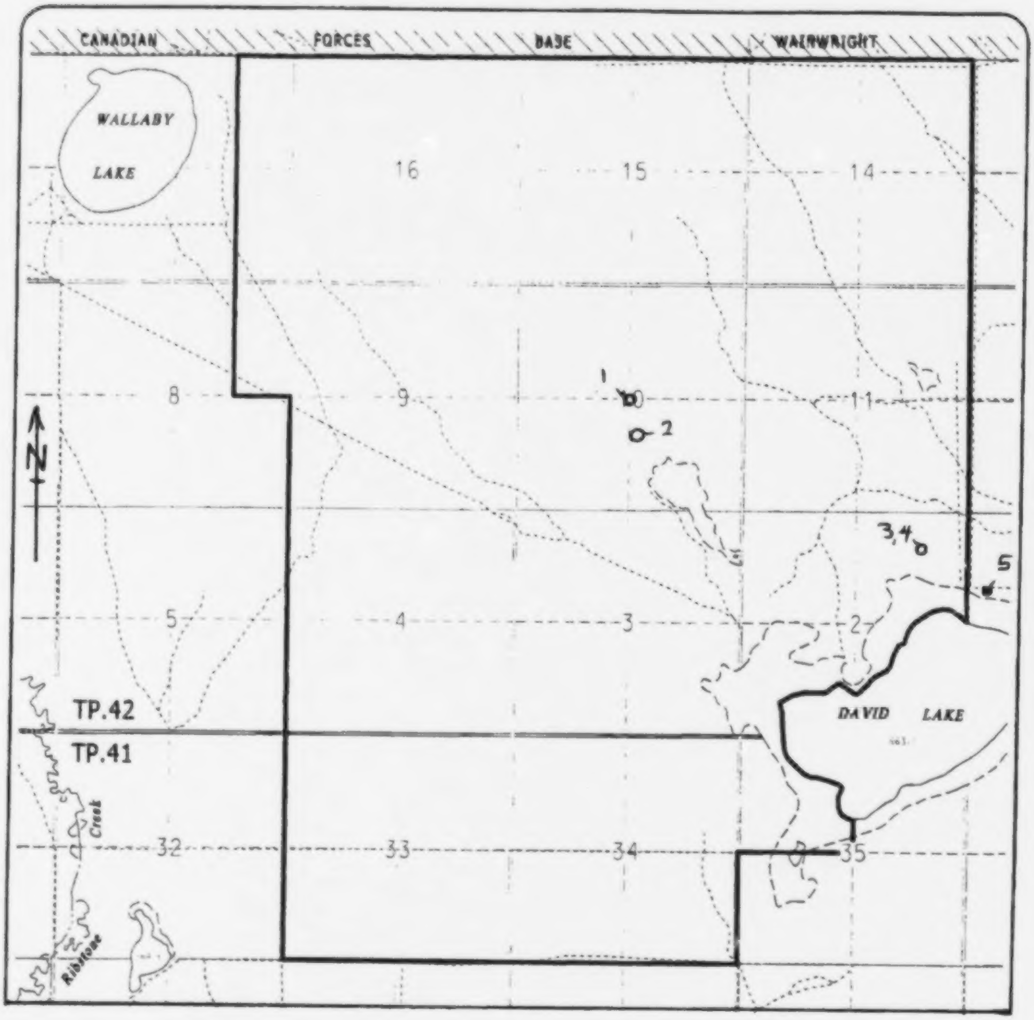
Phenology: vegetative	mid-June
Phenology: reproductive - inflorescence	late June, early July
Phenology: reproductive - flower	early July
Phenology: reproductive - fruit	mid- to late July
Habitat Threats	thicket clearing, water table fluctuation, grazing
Management Considerations	monitor population, determine brushing impact

Species location summary for *Carex crawei* in the Wainwright Dunes Ecological Reserve

map site / date site	location coordinates	number (size)	habitat
Cc1 - Carecra-86xxxxa	52°36.100'N 110°38.400'W	no information	extensive beaverpond & fen complex
Cc2 - Carecra-86xxxxb	52°35.900'N 110°38.400'W	no information	patterned fen
Cc3 - Carecra-920607a	UTM27 526675E 5826450N	no information	edge of aspen grove
Cc4 - Carecra-010731a	UTM27 526675E 5826450N	"hundreds"	edge of aspen grove
Cc5 - Carecra-020711b	52°35.355'N 110°36.145'W	13 (0.4m X 0.7m)	lake backshore shrubby marsh

Photo: *Carex crawei* (Crawe's sedge) plant detail: inflorescence with young perigynia (Cc5—Carecra-020711b - E11, photo Ian D. Macdonald)

Map: Species locations for *Carex crawei* in the Wainwright Dunes Ecological Reserve (o indicates approximate reported location)


CANADIAN
FORCES
BASE
WAINWRIGHT
WALLABY LAKE
16
15
14
8
9
11
5
4
3
2
32
33
34
35
TP.42
TP.41
DAVID LAKE
Creek
Ribstone
N
1
2
3,4
5

PREVIOUSLY REPORTED SPECIES LOCATIONS

map/date site: Cc1 - Carecra-86xxxxa
location: Wainwright Dunes Ecological Reserve // extensive wetland to the NW of David // see map Cc1
source: Cottonwood Consultants, Ltd. 1986.
reference: Cottonwood Consultants, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton.
observation: C. Wallis 1986
collection: no information
photo: no information
plant numbers: no information
note: none
habitat: "extensive beaver pond and fen complex"
comment: no accurate location indicated by Cottonwood 1986 in its Significant Features map, within the Great Fen basin; this locality about 52°36.100'N / 118°38.400'W (0.1') (map)

map/date site: Cc2 - Carecra-86xxxxb
location: Wainwright Dunes Ecological Reserve // extensive wetland to the NW of David // about SW5-10-2-5W4 // see map Cc2
source: —
reference: Cottonwood Consultants, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton.
observation: C. Wallis 1986
collection: no information
photo: no information
plant numbers: no information
note: none
habitat: patterned fen in extensive beaverpond and fen complex
comment: the Significant Features map in Cottonwood 1986 indicated this locality to be about 52°35.900'N / 118°38.400'W (0.1') (map), within the Great Fen basin

map/date site: Cc3 - Carecra-920607a
location: Wainwright Dunes Ecological Reserve // north of David Lake // UTM27 526675E 5826450N // UTM83 526676E 5826670N; UTM83 526651E 5826672N; UTM83 526261E 5826651N; UTM83 526175E 5826688N // see map Cc3

source: ANHIC // Element Occurrence PMCYP03360 # 010
reference: —
observation: J.D. Johnson & P. Cotterill 1992
collection: Johnson, J.D. & P. Cotterill // 7 June 1992 // CF# 930279 // ID-OK // specimen source code S01COTPPABCA01
photo: none
plant numbers: no information
note: (developing fruits); "cattle grazing may help or hinder this species."
habitat: "edge of aspen grove, near lake, imperfectly drained" // 665 m
comment: 5 locations for the species on northern backshore of David Lake, about 1 km NNE of peninsula monument; see also map Cc4

map/date site: Cc4 - Carecra-010731a
location: Wainwright Dunes Ecological Reserve // north of David Lake // UTM27 526675E 5826450N // UTM83 526676E 5826670N, UTM83 526651E 5826672N, UTM83 526261E 5826651N, UTM83 526175E 5826688N // see map Cc4
source: ANHIC // // Element Occurrence PMCYP03360 # 010
reference: Meijer, M. 2001. Survey of Rare Plant Element Occurrences in the Central Parkland Natural Subregion (includes Rare Native Plant Forms). open file, ANHIC, Edmonton.
observation: —
collection: Cotterill, P. & M. Meijer // 31 July 2001 // PP# 4396 // ID-OK // specimen source code S01COTPPABCA06
photo: none
plant numbers: numerous plants, probably extending across north shoreline // "hundreds of plants"
note: probably extending across north shoreline; all this area grazed by cattle; cattle grazing may help or hinder this species
habitat: "edge of aspen grove, near lake, imperfectly drained" // 665 m
comment: the same as above, 5 locations for the species on northern backshore of David Lake, about 1 km NNE of peninsula monument; see also map Cc3

RECENTLY DISCOVERED SPECIES LOCATIONS

map/date site: **Cc5 - Carecra-020711b**

location: adjacent to Wainwright Dunes Ecological Reserve; north side of David Lake, approximately 175 m east of the Wainwright Dunes Ecological Reserve eastern boundary fence, about 1.1 km NE of peninsula southern tip; 35 m S of backshore sand ridge; 12-1-42-5W4; see figure and map Cc5

lat./long.: (centre) 52°35.355'N / 110°36.145'W (0.025') (GPS)

collection: 020711b1 (1 replicate @ ALTA / rhizome / stem: full, 14-19 cm at inflorescence tip / leaf: full / inflorescence: full / flower: mature / fruit: early to submature)

photos: E9 (plant: growth habit and inflorescence) E10 (plant: mature plant, scale to ruler) E11 (plant detail: inflorescence with young perigynia) F3 (general habitat: lake backshore shrubby graminoid fen, pink ribbon marks plants) F4 (habitat detail: grasses and shrub bases, pink ribbon marks actual plant)

plant numbers: 13 flowering plants counted in 0.4 m X 0.7 m area; 80% with mature inflorescence in mid-flowering to early fruiting condition; this small population in a surveyed 10 m X 100 m corridor, with potential for many more

note: very difficult to find in this community; marked by permanent pink ribbon on poplar sapling 3m @ 290° from plants; approximately 35 m S of backshore sand ridge; area was cleared out completely several years previously (fide local rancher Hilson Maull); sample based on (1 m X 1 m quadrat); associated with Gentiana fremontii 020711a

habitat: David Lake drawdown backshore subhygric shrubby graminoid marsh, with semiclosed tall thicket of LOW SHRUB (semiopen to open) Salix pseudomonticola (5%), Betula occidentalis (2%); HERB (semiclosed) LITTER (22%), Carex lanuginosa (22%), **Carex crawei** (18%), Juncus balticus (15%), Crepis runcinata (4%), Solidago canadensis (4%), Carex aurea (3 %), Sisyrinchium montanum (1%), Gentiana fremontii (1%), Carex sartwellii (1%), Muhlenbergia glomerata (1%), Senecio pauperculus (1%); in association with calcareous herb cover species typical of calcareous seepage slope habitat, including Carex aurea, Carex viridula, Eleocharis quinqueflora, Primula incana, Senecio pauperculus

Photos: Photographs of habitats and plant locations for *Carex crawei* in the Wainwright Dunes Ecological Reserve (see compilation volume)

- Cc5—Carecra-020711b
  - E9(plant: growth habit and inflorescence)
  - E10(plant: mature plant, scale to ruler)
  - E11(plant detail: inflorescence with young perigynia)
  - F3(general habitat: lake backshore shrubby graminoid fen, pink ribbon marks plants)
  - F4(habitat detail: grasses and shrub bases, pink ribbon marks actual plant) lake backshore shrubby marsh

Carex houghtoniana Torr. *ex* Dewey—**sand sedge**—***CYPERACEAE***

This upland sedge of dry sandy and gravelly acid sites, gravel pits and open forest habitats has a provincial Rank of **S2** in Alberta and a global Rank of **G5** (Vujnovic & Gould 2002, ANHIC 2002). It is a medium-sized perennial erect sedge that spreads by rhizomes, and that has stiff leaves and culm. It has one to several staminate spikes that are well-separated from the two pistillate spikes, with notably hairy perigynia that are 5 to 7 mm long. This species is similar to the other two members of the Section *Hirtae* occurring in Alberta, *Carex lanuginosa* and *Carex lasiocarpa*, except that its perigynia are longer (rather than from only 2 to 5mm long in the above), have distinct, coarse, rib-like veins on its surface (rather than relatively less protrusive veins), have perigynial scales that are notably acute to awned (rather than merely acute), and are shorter than the perigynia (rather than about as long). The foliage tends to be somewhat yellowish green (rather than green to occasionally bluish green), and invariably itis a species of dry, coarsely textured substrate (rather than wetland sites). Additionally, its notably pubescent perigynia separate it from another rare, wetland species, *Carex crawei*, that also occurs in the Ecological Reserve and has a similar but smaller growth habit.

This species occurs across Canada eastward of the Rocky Mountains, and also is rare in Newfoundland and three states (NatureServe 2003, Kershaw *et al.* 2001). In Alberta it has 11 known locations with concentrations in the lower elevations of the Rocky Mountain Natural Region west of Edmonton, with isolated locations near Fort McMurray and on the Canadian Shield (ANHIC 2003). It was not mapped from the Parkland Natural Region in the ANHIC (2002) data base, nor in *Rare Vascular Plants of Alberta* (Kershaw *et al.* 2001). However, the significant features map in Cottonwood Consultants, Ltd. (1986) indicated that the species occurred within the northwestern portion of the Ecological Reserve about 3 km northwest of David Lake (52°36.950'N / 110°39.790'W). C. Wallis (2002) confirmed that this was his record and that he was confident of the record, and further, he thought that he had made a collection that may be at the University of Alberta herbarium. No specimen was found at the provincial parks herbarium. The potential habitats in the general location of his record were surveyed during the 2002 project, but in only one instance was the plant thought to be found, although formal determination of the vouching specimen realized that this population actually was *Carex lanuginosa* occurring in an extremely unusual upland situation.

The typical habitat for this species is a variety of dry upland situations, including gravel pits, sandy & gravelly acid sites, and open forests. Wallis' record had the species occurring in an active sand dune blowout with light grazing, but no specifics of the habitat or population were available. The active blowout site where the *Carex lasiocarpa* population was located during the current survey was an otherwise typical, very dry blowout of extremely open sand with *Calamovilfa longifolia*, *Carex pensylvanica* var. *digyna, Prunus virginiana* and the rare *Shinneroseris rostrata* and *Cyperus schweinitzii.*

The habitat threats to this species in a blowout situation would be erosion or drifting sand, and the source report (ANHIC 2002) indicated that grazing may have a minor impact. However, the potential locations examined did not present serious impacts from either of these disturbances.

The management considerations for this species would be to confirm the existence of this species within the Ecological Reserve, either through finding and confirming any specimens, or refinding the actual population. In the interim, some measure of access control to the area may be required since signs of ATV trails were in the immediate vicinity. Otherwise the location is remote enough to have had very little human or cattle visitation in the past decade.

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Carex houghtoniana* in the Wainwright Dunes Ecological Reserve

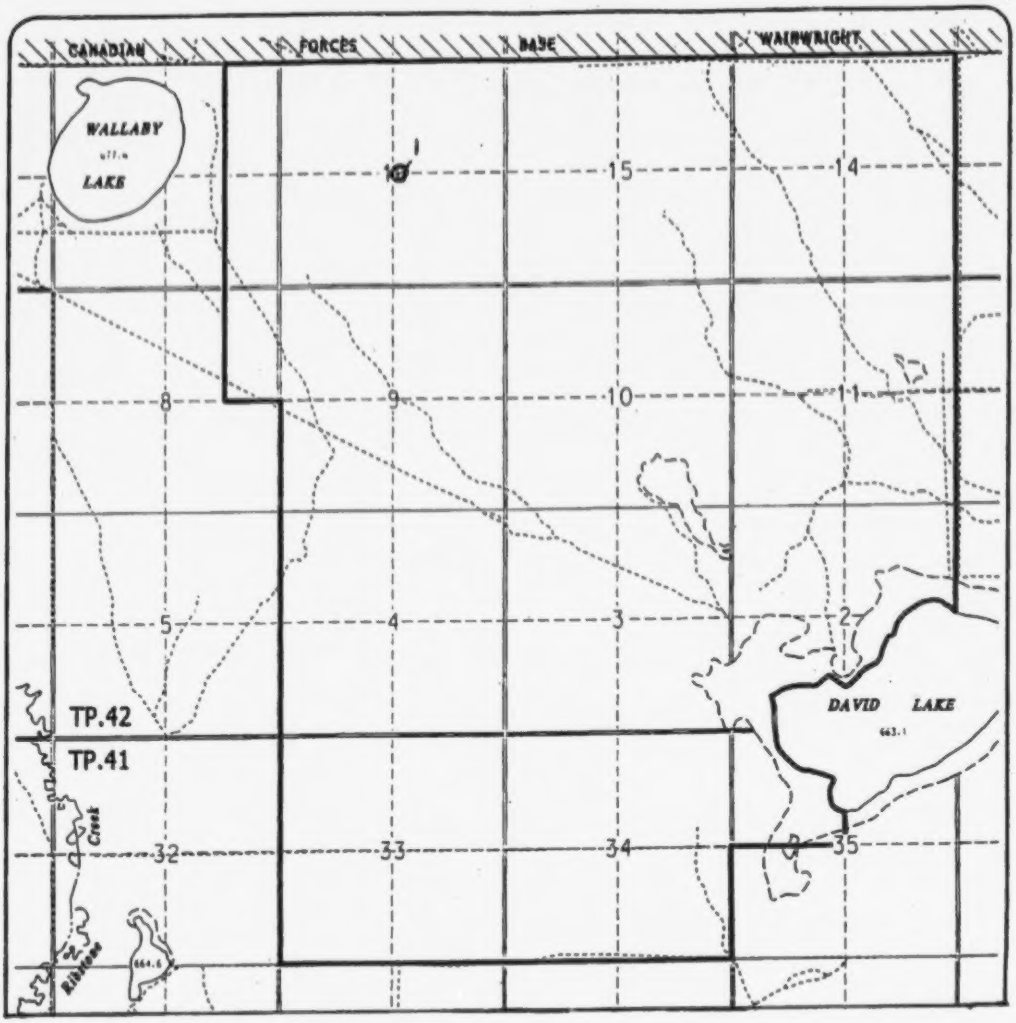
ECOLOGICAL LAND SURVEY SITE DESCRIPTION	
Exposure Type	wind (2), insulation (3)
Flood Hazard	none
Soil Drainage	well drained (3), rapidly drained (2)
Perviousness	rapidly (3)
Site: Macro	plain (7)
Site: Meso	?midslope (3)
Site: Micro	straight (1)
Site: Surface Shape	concave (2)
Ecological Moisture Regime	xerix (2), very xerix (1), subxeric (3)
Nutrients	?submesotrophic (2)
Successional Status: 1	pioneer (1)
Successional Status: 2	not apply
Disturbance Factors	not apply

ANHIC RARE NATIVE PLANT REPORT	
Phenology: vegetative	no information
Phenology: reproductive - inflorescence	no information (?June to July?)
Phenology: reproductive - flower	no information (?June to July?)
Phenology: reproductive - fruit	no information (?July to August)
Habitat Threats	blowout erosion
Management Considerations	finding & monitoring populations, limiting access

Species location summary for *Carex houghtoniana* in the Wainwright Dunes Ecological Reserve

map site / date site	location coordinates	number (size)	habitat
Ch1 - Carehou-86xxxxa	NW7-16-2-5W4	no information	active blowout - lightly grazed

Map: Species locations for *Carex houghtoniana* in the Wainwright Dunes Ecological Reserve (o indicates approximate reported location)


CANADIAN
FORCES
BASE
WAINWRIGHT
WALLABY LAKE
1
16
15
14
8
9
10
11
5
4
3
2
DAVID LAKE
TP.42
TP.41
32
33
34
35
Ribstone
Creek

PREVIOUSLY REPORTED SPECIES LOCATIONS

map/date site: **Ch1 - Carehou-84xxxxa**

location: Wainwright Dunes Ecological Reserve // NW7-16-2-5W4 // about 52°36.950'N / 110°39.790'W

source: Cottonwood Consultants, Ltd. (1986); C. Wallis (pers. com. - I.D. Macdonald)

reference: Cottonwood Consultants, Ltd. 1986. The Proposed Wainwright Ecological Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton.

observation: C. Wallis 1985

collection: no information (possibly at ALTA?)

photo: none

plant numbers: no information

note: (Wallis indicated that he had confidence in this record, and thought that he did make a vouching collection, possibly at the University of Alberta herbarium)

habitat: active blowout - lightly grazed

comment: The Significant Features map in Cottonwood Consultants, Ltd. (1986) indicated the species at this location in the northwestern portion of the ecological reserve, about 3 km northwest of David Lake. It was surveyed in 2002 (see below), but no plants were discovered. A potential collection from the dune complex at 52°36.975'N / 110°36.785'W, in the immediate vicinity of the indicated location, proved to be Carex lanuginosa (Macdonald 020716g1 - PP# 4890) in an extremely open, very dry blowout habitat of 50-75% SAND; 5-20% LITTER; 1-5% Carex lanuginosa - Calamovilfa longifolia - Cyperus schweinitzii; <1% Carex pensylvanica var. digyna - Shinneroseris rostrata (see 020716h) - Prunus virginiana. This site also held two rare species, Shinneroseris rostrata (020716h) and Cyperus schweinitzii (020716f); there is a slight chance that Wallis' entry for this sedge species may actually have been a transcription error for "Cyperus houghtonii", an erect species that resembles the Alberta rare species Cyperus schweinitzii, that is in this habitat.

RECENTLY DISCOVERED SPECIES LOCATIONS

(none)

Figure: Location maps and habitat diagrams for *Carex houghtoniana* in the Wainwright Dunes Ecological Reserve

(none)

Photo: Photographs of habitats and plant locations for *Carex houghtoniana* in the Wainwright Dunes Ecological Reserve

(none)

Carex parryana **Dewey var. *parryana*—Parry's sedge—*CYPERACEAE***

This perennial semicespitose sedge of moist open meadows, swales and other lowland habitats has a provincial Rank of **S1S2** in Alberta, and a global Rank of **G4T4** (Vujnovic & Gould 2002, ANHIC 2002). The plant has stiff basal leaves that rise in loose tufts with reddish-tinted bases from a rhizome. There is an erect, obtusely triangular culm that is topped by a tight, narrow inflorescence of stiffly ascending terminal and lateral spikelets, with small perigynia and short staminate spikelets that are crowded at the base of the terminal spike, and a very short, sheathless bract at the base of the bottom spikelet. There is only one sedge species in the ecological reserve that shares its habitats and initially could be confused with this distinctive species, *Carex scirpoidea*. While this sedge also has stiffly erect culms and basal leaves, it differs in having pubescent perigynia in a single, densely fruited, cylindrical spikelet (Moss 1983).

This species occurs in the northwestern quarter of North America, and also is rare in Ontario, and in Wyoming (NatureServe 2003). In Alberta it has 24 wide-spread known locations in the central Rocky Mountain, Parkland and Grassland Natural Regions, with several known populations in alkaline and salty springs and shore sites occurring within 30 km of the Ecological Reserve (ANHIC 2003, Kershaw *et al.* 2001). There were four previous records within the Reserve from the northern shore and vicinity of the peninsula of David Lake, originally recorded by Fehr (1984), Cottonwood Consultants, Ltd (1986) (although not mapped by them), Wallis (1990) and Meijer (2001). The survey in 2002 discovered an additional nine records from within the Reserve around the David Lake basin, with the greatest known concentrations around the southern and southwestern end of the David Lake peninsula, the eastern side of the peninsula's base, and the bay on the lake basin's western side. Additionally, several smaller scattered species locations were recorded on the general grassland in the inland body of the peninsula, in the hummocky seepage meadows and in the lake basin's northern backshore. As well, an additional four new records were discovered from the eastern side of the basin, but outside of the Reserve's boundaries, with the probability that similar populations also extend along the southeastern side of the basin's offshore.

The numbers for this species within the general vicinity of David Lake totaled 23 646 individuals, as based on actual counts of culms and basal leaf clusters. Even recognizing that with its rhizomatous character, each individual plant of this species may produce several such clusters, the population still is notable for the province. And, it is likely that many more individuals also occurred elsewhere around the periphery of the lake basin. Within the Ecological Reserve boundaries there were 12 621 individuals counted in 13 sampled sites, and outside the boundaries there were 11 025 individuals in four sampled sites. The number of plants at the sites varied from about 20 to over 10 000 individuals in areas from 4 m X 5 m, to over 100 m X 100 m. As well, along the peninsula's eastern side they occurred as a zone 35 m wide and 200 m along the offshore that encompassed 17 widely spaced concentrations with 355 individuals. In 2002, the populations within the reserve were setting leaves and very young inflorescence buds by mid-June, with the inflorescences in full development and in flower by mid- to late June to early July, and with fruit development proceeding from mid- to late June through to mid- or late July.

The inventory of saline wetlands and spring habitats by Wallis (1990) described this species as being a "facultative wetland species, (occurring) in springs" with no other comment in his summarizing species list; however, he also indicated that "(*Carex parryana*) occurs occasionally on hummocks ... and ... most forbs in this wettest portion of the springs (i.e., wet spring meadows) also occur on hummocks" (page 14), and that it occurred "at Dune Point Springs' saline springs with an open drier area of *Distichlis stricta, Puccinellia nuttalliana* ... with *Aster parviflorus*" (page 41). In the Reserve, the largest concentrations of the species around the David Lake basin occurred in the nearshore and offshore drawdown alkaline meadows which are essentially level, and in the hummocky terrain that was created by cattle trampling and grazing patterns. Due to the drought conditions at the time of the 2002 survey, both of these formerly hygric to subhydric habitat situations were mesic to subhygric at best. The community associated with the species was a semiclosed to semiopen graminoid meadow of *Distichlis stricta, Calamagrostis stricta, Carex praegracilis* (graceful sedge), *Deschampsia cespitosa, Agropyron trachycaulum, Juncus balticus, Antennaria parvifolia, Potentilla anserina* and others, and it was associated with the rare *Aster pauciflorus* and *Muhlenbergia asperifolia*. This habitat usually extended some 50 to 100 m offshore, but not into the increasing concentration of *Hordeum jubatum* cover that continued as the dominant cover further out into the basin. Backshore and nearshore habitats on the northern and western sides of the lake basin supported rather richer, more closed meadow communities, often with several calcareous seepage associated species that occurred, at least as traces. Typical of these communities were *Deschampsia cespitosa, Calamagrostis stricta, Juncus balticus, Agropyron trachycaulum, Glaux maritima, Sonchus uliginosus, Dodecatheon pulchellum, Primula incana, Crepis runcinata* and others. Back from the lake basin near the base of the peninsula were several strongly-developed hummocky meadow sites which supported local and small populations of the sedge. These had closed, tight carpets of *Antennaria parvifolia, Carex stenophylla* var. *eleocharis* (low sedge), *Carex scirpoidea, Deschampsia cespitosa, Juncus balticus* and others, and may well also have been a habitat for the rare *Gentiana fremontii*. This habitat apparently occurred on calcareous seepage slopes that normally were hygric, although they were virtually submesic during the 2002 drought conditions. The hummocks themselves appeared to have been created by the trampling of cattle moving through the sites in the wetter conditions, although little grazing was evident during the 2002 survey. These habitats currently supported only very sparse groups of the sedge, but they have potential to have more away from the lakeshore in moister times.

Any habitat threats to the recent plant locations in the lake basin and backshore sites must be related to the prolonged regional drought conditions. The drawdown conditions of the lake level undoubtedly has extended the potential habitat for the species considerably around the David Lake basin. This habitat supported over 85% of the reserve's population, while during moister climatic conditions the plants probably would be limited to the more narrow shoreline zones around the lake. On the other hand, wetter conditions would revitalize the populations in the seepage slope hummocky meadows which occurred in at least eight depressions in the gently rolling sandland back from the basin's northwestern side. Grazing by cattle did not appear to present a significant impact on the plant locations; the coarseness of the leaves and culms did not appear to be favored over the relatively more palatable grasses in the same habitat.

Management concerns for the species at this time should include monitoring the populations around the David Lake basin and in the hummocky seepage slope meadows, particularly concerning the long term impacts of the prolonged drought conditions on the foliage and seed production. As noted above, grazing by the resident cattle did not appear to present a problem for the populations here, although such pressures should also be monitored.

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Carex parryana* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION	
Exposure Type	not apply
Flood Hazard	may be expected (3)
Soil Drainage	moderately well drained (4), imperfectly drained (5), poorly drained (6)
Perviousness	slowly (3), moderately (2)
Site: Macro	plain (7)
Site: Meso	level (7), depression (6)
Site: Micro	hummocky (2), straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	subhygric (6), hygric (7), subhydric (8)
Nutrients	?hypereutrophic (6), eutrophic (5)
Successional Status: 1	young seral (2)
Successional Status: 2	not apply
Disturbance Factors	water related (8)

ANHIC RARE NATIVE PLANT REPORT	
Phenology: vegetative	early to mid-June
Phenology: reproductive – inflorescence	early to mid-June
Phenology: reproductive – flower	mid-June to early July
Phenology: reproductive – fruit	mid- to late June, to mid- to late July
Habitat Threats	flooding, grazing
Management Considerations	monitoring populations and grazing impacts

Species location summary for *Carex parryana* in the Wainwright Dunes Ecological Reserve (+ indicates population outside reserve boundaries)

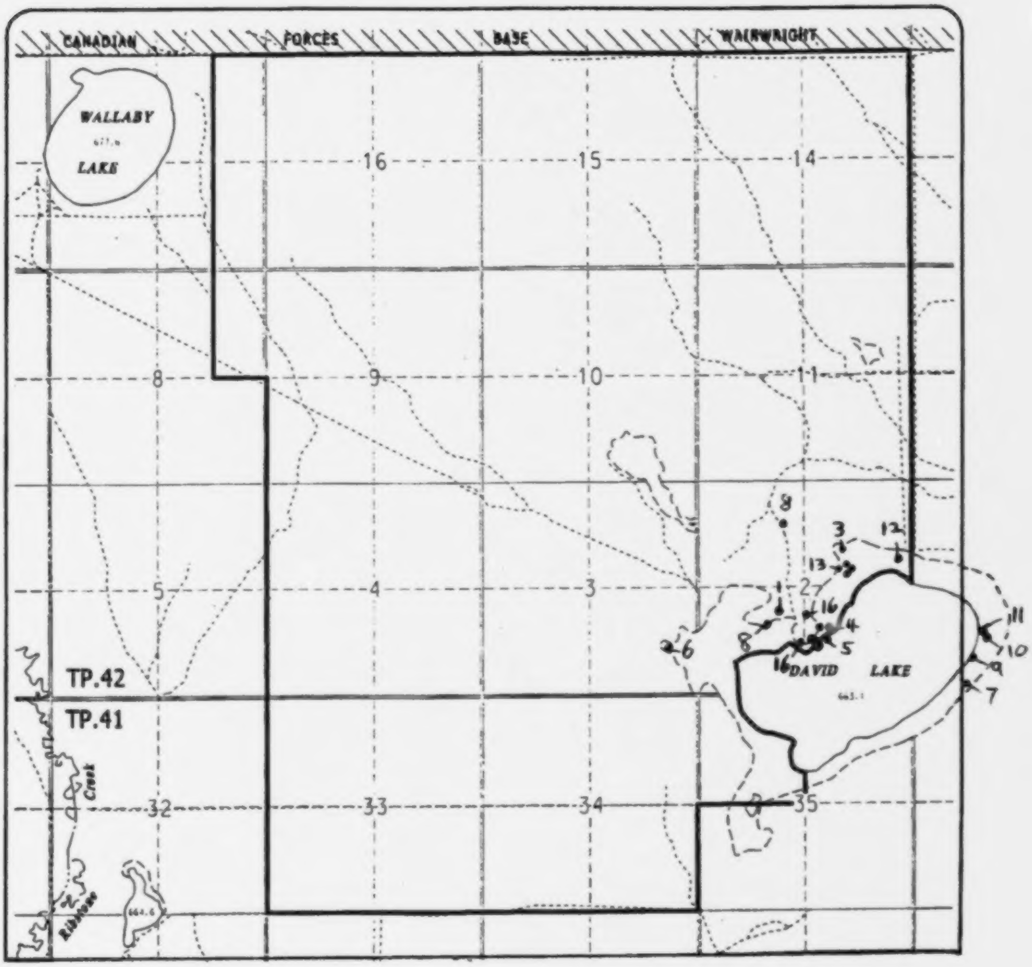
map site/ date site	location coordinates	number (size)	habitat
Cp1 – Carepar-83xxxa	UTM27 525850E 5826000N	no information	wet calcareous grassland
Cp2 – Carepar-00xxxa	UTM27 526500E 5826250N	no information	wet saline and subsaline lakeshore meadow

map site/ date site	location coordinates	number (size)	habitat
Cp3 - Carepar-01xxxa	also UTM27 526300E 5826396N and 526342E 5826482N	10 & 8 (resp.)	wet saline and subsaline lakeshore meadow
Cp4 - Carepar-020613e	52°35'09.4"N/110°37'00.4"W	26 (7m X 25m)	hummocky seepage grassland
Cp5 - Carepar-020614a	52°35.011'N / 110°36.810'W	10 000 (70m X 70m)	drawdown lake offshore meadow
Cp6 - Carepar-020614b	52°34.955'N / 110°37.801'W	>800 (40m X 40m)	drawdown lake nearshore meadow
+Cp7 - Carepar-020614n	52°34.775'N / 110°35.969'W	no information	drawdown lake offshore
Cp8 - Carepar-020615b	52°35.459'N / 110°37.083'W	8 (4m X 5m)	hummocky seepage grassland
+Cp9 - Carepar-020615k	52°35.050'N / 110°37.183'W	>1 000 (100m X 100m)	drawdown lake nearshore meadow
+Cp10 - Carepar-020710b	52°34.826'N / 110°35.915'W	25 (12m X 25m)	drawdown lake alkali nearshore meadow
+Cp11 - Carepar-020710c	52°34.984'N / 110°35.759'W	>10 000 (60m X 100m)	drawdown lake near- and offshore meadow
Cp12 - Carepar-020712c	52°35.317'N / 110°36.308'W	180 (10m X 44m)	grassy hummock backshore meadow
Cp13 - Carepar-020815a	52°34.975'N / 110°35.860'W	>500 (54m X 300m)	drawdown lake nearshore hummocky meadow
Cp14 - Carepar-020817a	52°35.276'N / 110°36.718'W	several	drawdown lake offshore meadow
Cp15 - Carepar-	52°35.243'N / 110°36.688'W	355 (35m X 200m)	drawdown lake nearshore hummocky

map site/ date site	location coordinates	number (size)	habitat
020817d			meadow
Cp16 - Carepar-020818a	52°34.980'N / 110°36.904'W	20 (45m X 110m)	lake nearshore hummocky meadow
Cp17 - Carepar-020818c	52°34.970'N / 110°36.956'W + 52°35.001'N / 110°36.895'W	732 (15m X 230m)	lake nearshore hummocky meadow

Photo: *Carex parryana* (Parry's sedge) plant detail: vigorous growth in drawdown lake meadow (Cp11—Carepar-020710c–D15, photo Ian D. Macdonald)

Map: Species locations for *Carex parryana* in the Wainwright Dunes Ecological Reserve (o indicates approximate reported location)


CANADIAN
FORCES
BASE
WAINWRIGHT
WALLABY
LAKE
16
15
14
8
9
10
11
5
4
3
2
TP.42
TP.41
Creek
Ribstone
32
33
34
35
DAVID
LAKE
1
2
3
4
5
6
7
8
9
10
11
12
13
16

map/date site: **Cp1 - Carepar-830xxxa**
location: Wainwright Dunes Ecological Reserve // north of David Lake // UTM27 525850E 5826000N // see map Cp1
source: ANHIC // Element Occurrence PMCYP03A35 # 006
reference: Fehr, A. 1984. Wainwright Study Area: A Biophysical Inventory. Alberta Energy and Natural Resources.
observation: vegetation plot: AF83042
collection: 1) Fehr, A. // PP# 1975 // see comment below // specimen code S83FEHPPABCA03
2) Fehr, A. & T.S. Bakshi // AU# 83-0522 // ID-OK // specimen code S83FEHAUABCA01
3) Fehr, A. // PMAE# B86.17.57 // ID-OK // specimen code S83FEHPMABCA03
photo: none
plant numbers: no information
habitat: wet calcareous grassland // 662 m
note: none
comment: collection 1) examined at Alberta Parks by IDM-02; originally determined by K. E. Tannas; vidi - stet!—IDM-02; collection date 16 June 1983; specimen showing culm with spikelets; original lable indicates: habitat is "wet grassland - calcareous", location is 2-42-5W4, population is "uncommon - moist areas"

interpretation of Fehr 1984 vegetation plot data for Study Area ID 042, as follows:

location in Wainwright Dunes Ecological Reserve; David Lake ca 300 m NNW of peninsula's southern tip; UTM27 525620 5826380 (50 m) (map); SE6-2-42-5W4

population is sparse

habitat is shallow depression on gently rolling sand plain with hummocky terrain of subxeric organic soil supporting graminoid seepage meadow of HERB (70% - semiclosed) SOIL (humus) (60%) - Potentilla anserina (30%) - SOIL (mineral) (20%) - Distichlis stricta (15%) - Antennaria parvifolia (originally A. nitida) (10%) - Poa pratensis (7%) - Glaux maritima (5%) - Hordeum jubatum (5%) - Juncus balticus (5%) - Agropyron trachycaulum subsp. trachycaulum (3%) - Agropyron trachycaulum subsp. subsecundum (3%) - Artemisia frigida (3%) - **Carex parryana** (3%) - Cerastium arvense (3%) - Deschampsia cespitosa (3%) - ROCK (3%) - Calamagrostis inexpansa (2%) - Crepis runcinata (2%) - Potentilla pensylvanica (2%) - Puccinellia nuttalliana

(2%) - Carex diandra (1%) - Carex ?lanuginosa (originally C. lasiocarpa) (1%) - Carex praegracilis (1%) - Carex prairea (1%) - Cirsium arvense (1%) - Cirsium vulgare (1%) - Potentilla (species) (1%) - Ranunculus cymbalaria (1%) - Salicornia ?aristata (1%) - Senecio pauperculus (1%) - Suaeda calceoliformis (1%) - Taraxacum officinale (1%) - Achillea millefolium (0.5%) - Lepidium ramosissimum (0.5%) - Plantago major (0.5%) - Viola adunca (0.1%)

map/date site: **Cp2 - Carepar-00xxxxa**
location: Wainwright Dunes Ecological Reserve / T41-R5-W4 & T42-R5-W4 // David Lake // UTM27 526500E 5826250N (250 m) (polygon mapping only) // see map Cp2
source: ANHIC //
reference: Wallis C. 1990. Reconnaissance Survey of Saline Wetlands and Springs in the Grassland-Parkland Region of Eastern Alberta // reference source code U01ME101ABCA
observation: no information
collection: no information
photo: none
plant numbers: no information
note: Wallis recommended "protect entire wetland basin with sufficient setback; reduce grazing pressure on meadows west of lake"
habitat: "wet saline and subsaline meadows round lake; along subsaline higher edges and hummocks" // 665 m
comment: the second and third ANHIC locations appear to be GPS derived and are in NW10-2-42-5W4; located about 700 m NNE of David Lake peninsula's southern tip

map/date site: **Cp3 - Carepar-01xxxxa**
location: Wainwright Dunes Ecological Reserve / T41-R5-W4 & T42-R5-W4 // David Lake // UTM27 526300E 5826396N UTM27 526342E 5826482N // see map Cp3
source: ANHIC // Element Occurrence EOPMCYP03A35 # 014
reference: Meijer, M. 2001. Survey of Rare Plant Element Occurrences in the Central Parkland Natural Subregion (includes Rare Native Plant Report Forms) // reference source code U01ME101ABCA
observation: —
collection: no information
photo: none
plant numbers: UTM27 526300E 5826396N = 10 plants & UTM27 526342E 5826482N = 8 plants (accurate mapping)

note: none

habitat: wet saline and subsaline meadows round lake; along subsaline higher edges and hummocks // 665 m

comment: the second and third ANHIC locations appear to be GPS derived and are in NW10-2-42-5W4; located about 700 m NNE of David Lake peninsula's southern tip

RECENTLY DISCOVERED SPECIES LOCATIONS

map/date site: **Cp4 - Carepar-020613e**

location: Wainwright Dunes Ecological Reserve; NW side of David Lake, 300 m N of the peninsula's southern tip; SW6-2-42-5W4; see figure and map Cp4
lat./long.: (centre) 52°35'09.4"N / 110°37'00.4" (0.025') (GPS)

collection: 020613a1 (voucher / inflorescence: old / fruit: old) 020613a9 (voucher / inflorescence: old (2001), 45 - 52 cm height / fruit: old)

photos: A26 A28 (habitat detail: now-subxeric seepage slope hummock site, scale to pen) A27 (general habitat: now subxeric seepage slope hummock meadow, scale to clipboard, potential habitat for Gentiana fremontii)

plant numbers: 26 plants counted in 7 m X 25 m area; all with previous year's mature inflorescence with old fruits

note: Gentiana fremontii previously recorded from this habitat; hummock landform created by grazing cattle trampling when site is moister

habitat: very gently seepage slope, now essentially dry, with alkaline sand hummocks having closed meadow of >75% Antennaria parvifolia; 5-20% Distichlis stricta - Carex stenophylla; 1-5% Agropyron trachycaulum - Carex scirpoidea - Deschampsia cespitosa; <1% Artemisia frigida - Symphoricarpos occidentalis - Calamagrostis inexpansa - Carex ?obtusata - **Carex parryana** (early summer herb cover)

map/date site: **Cp5 - Carepar-020614a**

location: Wainwright Dunes Ecological Reserve; NW side of David Lake, 200 m ENE of peninsula's southern tip; 40 m to 60 m offshore from high water line; NW7-2-42-5W4; see figure and map Cp5
lat./long.: (centre) 52°35.011'N / 110°36.810'W (between 52°35.068'N / 118°36.796'W? on NW and 52°35.011'N / 110°36.851'W? on SE) (0.025') (GPS)

collection: 020614a10 (habitat 1 / 1 replicate @ ALTA / rhizome / leaf: submature, 7-12 cm / inflorescence: full, 12-23 cm / flower: young to mature / fruit: young) photos: A29 (general habitat: drawdown lake offshore alkaline marsh) A30 (habitat detail: drawdown lake offshore alkaline marsh)

plant numbers: approximately 10 000 plants counted in 70 m X 90 m area; only previous year's mature inflorescence with old fruits present; habitat 2 has the densest populations

note: associated with Aster pauciflorus (see 020817a) and Muhlenbergia asperiflora (see 020817b); two habitat phases: nearshore (1) and offshore (2); in good growth areas the culms are over 40 cm tall; habitat communities are early summer samples

habitat 1: drawdown lake nearshore subhygric alkaline sand with semiclosed to closed graminoid meadow of 50–75% Distichlis stricta - Juncus balticus; 5–20% Calamagrostis stricta; 1–5% Glaux maritima - Carex praegracilis - SOIL (alkaline sand) - Deschampsia cespitosa; <1% Agropyron trachycaulum - Aster ericoides - **Carex parryana** - Puccinellia nuttalliana - Hordeum jubatum - Gentianella amarella - Aster brachyactis - Carex □ Ovales - Triglochin maritima - Agropyron smithii - Triglochin palustris - Parnassia palustris - Salix ?pedicellaris - Scirpus pungens - Carex lanuginosa - Potentilla anserina - Carex aurea - Sonchus uliginosus - Primula incana

habitat 2 : drawdown lake offshore subhygric alkaline sand with semiclosed to closed graminoid meadow of 50–75% Distichlis stricta; 5–20% Agropyron trachycaulum - **Carex parryana** - SOIL (alkaline sand) - Glaux maritima; 1–5% Potentilla anserina - Carex obtusata - Aster ericoides; <1% Scirpus pungens - Sonchus uliginosus - Gentianella amarella

map/date site: **Cp6 - Carepar-020614b**

location: Wainwright Dunes Ecological Reserve; western side of David Lake, 1 km W of peninsula's southern tip, to west of dugout; NE1-3-42-5W4; see figure and map Cp6
lat./long.: (centre) 52°35.955'[illegible] / 110°36.801'W (0.025') (GPS)

collection: 020614b1 (1 replicate / rhizome @ PP-4865 / leaf: full, 15 cm / inflorescence: full, 20–23 cm / flower: mature / fruit / submature to mature / old (2000) inflorescence and fruit)

photos: A31 (general habitat: extensive subxeric grassland and drawdown lake nearshore meadow) A32 (habitat detail: drawdown lake nearshore meadow, blue flags mark plants) A33 (general habitat: extensive subxeric grassland and drawdown lake offshore meadow) A34 (habitat detail: drawdown lake nearshore subhygric grassland, scale to pen)

plant numbers: over 800 plants counted in 40 m X 40 m area; population occurring in local patches; only previous year's culm evident with old inflorescence and fruit development; samples have 12 to 17 plants per 1 m X 1 m note: site considerably wetter during high lake level years; shrub thicket to N and NW and poplar - aspen forest to SW and S; some grazing; early summer community survey

habitat: drawdown lake bay subhygric marshy graminoid fen of 50–75% Potentilla anserina - Calamagrostis ?stricta - Deschampsia cespitosa; 5–20% Agropyron trachycaulum - Juncus balticus - Carex stenophylla - Carex ?obtusata; 1–5% Hordeum jubatum; <1% Aster ?ericoides - Dodecatheon pulchellum - **Carex parryana** - Cirsium flodmanii - Achillea millefolium - Sisyrinchium montanum - Sonchus uliginosus - Smilacina stellata - Thalictrum venulosum

map/date site: **Cp7 - Carepar-020614n**

location: adjacent to Wainwright Dunes Ecological Reserve; SE side of David Lake, 1.2 km SE of the peninsula's southern tip; NE13-36-41-5W4; see map Cp7
lat./long.: (centre) 52°34.775'N / 110°36.969'W (0.025') (GPS)

collection: none

photo: none

plant numbers: no information; only previous year's inflorescences evident; 10 old culms recorded

note: none

habitat: drawdown lake nearshore subhygric alkaline sand with semiclosed to closed graminoid meadow of Distichlis stricta - Juncus balticus - Calamagrostis stricta - Glaux maritima - Carex praegracilis - SOIL (alkaline sand) - Deschampsia cespitosa - **Carex parryana** - Puccinellia nuttalliana - Hordeum jubatum - Gentianella amarella (no cover values recorded)

map/date site: **Cp8 - Carepar-020615b**

location: Wainwright Dunes Ecological Reserve; north of David Lake, along vehicle track to peninsula, 900 m NNW of peninsula's southern tip; NW14-2-42-5W4; see figure and map Cp8
lat./long: (centre) 52°35.459'N / 110°37.083'W (0.025') (GPS)

collection: none

photo: none

plant numbers: 8 plants counted in 4 m X 5 m area; only previous year's culms and inflorescences present at this time

note: moisture regime subhygric in non-drought conditions; site at edge of rolling grassland; Elaeagnus commutata encroaching on hummocks

habitat: gently rolling sandplain with alkaline seepage slope hummock development supporting submesic grazed low graminoid meadow of

50-75% Antennaria parvifolia - Carex stenophylla subsp. eleocharis; 5-20% Juncus balticus - Symphoricarpos occidentalis - Agropyron trachycaulum; 1-5% Deschampsia cespitosa - Achillea millefolium; <1% Smilacina stellata - Cirsium flodmanii - SOIL (alkaline sand) - Anemone cylindrica - Carex scirpoides - **Carex parryana** - ?Aster (species) - Zizia aptera - Taraxacum officinale - Potentilla gracilis - Thalictrum venulosum - Poa pratensis (early summer survey)

map/date site: **Cp9 - Carepar-020615k**
location: Wainwright Dunes Ecological Reserve; west side of David Lake, to west of peninsula, 300 m WNW of peninsula's southern tip; SW7-2-42-5W4; see map Cp9
lat./long.: (centre) 52°35.050'N / 110°37.183'W (0.025') (GPS)
collection: none
photo: none
plant numbers: over 1 000 plants counted in over 200 clusters of plants in 100 m X 100 m area with irregular boundary; generally scattered local concentrations with 30 per square metre
note: cursory survey only
habitat: drawdown lake offshore subhygric alkaline with closed meadow of 50-75% Carex stenophylla - Agropyron trachycaulum - Potentilla anserina; 5-20% Distichlis stricta; 1-5% Juncus balticus - Antennaria parvifolia - (unidentified grass); <1% **Carex parryana** - Cirsium flodmanii - Sonchus uliginosus

map/date site: **Cp10 - Carepar-020710b**
location: adjacent to Wainwright Dunes Ecological Reserve; east side of David Lake, 1.1 km ESE of peninsula's southern tip, about 65 m @ 355° from the fence gate; SE4-1-42-5W4; see map Cp10
lat./long: (centre) 52°34.826'N / 110°35.915'W (0.025') (GPS)
collection: 020710b1 (1 replicate @ ALTA / rhizome / leaf: full, 12 cm / inflorescence: full, 20 cm / fruit: submature to mature)
photos: D12 (general habitat: drawdown lake nearshore alkaline meadow, pink flags mark plants) D13 (habitat detail: drawdown lake nearshore alkaline meadow, scale to ruler)
plant numbers: 25 plants counted in 7 clusters in 12 m X 25 m area; only one of present year's leaf rosettes have developing flowering culms; otherwise mostly previous year's culms evident with inflorescences and old fruits at this time; larger population to NE (020710c)
note: associated with Muhlenbergia asperifolia (020815b)
habitat: drawdown lake bed alkaline sand nearshore open meadow of 50-75%

Distichlis stricta - LITTER - Antennaria parvifolia; 5-20% Potentilla anserina - SOIL (alkaline sand) - Juncus balticus; 1-5% Elymus ?trachycaulum - Equisetum variegatum - Poa ?sandbergii; <1% Calamagrostis stricta - Carex scirpoides - **Carex parryana** - Gentianella amarella - Linum lewisii - Populus balsamifera (seedling) - Sonchus uliginosus

map/date site: **Cp11 - Carepar-020710c**

location: adjacent to Wainwright Dunes Ecological Reserve; NE side of David Lake, 1.3 km E of peninsula's southern tip; SW3-1-42-5W4; see figure and map Cp11

lat./long: (centre) 52°34.984'N / 110°35.759'W (0.025') (GPS)

collection: 020710c1 (2 replicates - UAC & ALTA / rhizome: cespitose / leaf: full / inflorescence: full / fruit: mature / height: 45 cm)

photo: D14 D16 (general habitat: drawdown lake offshore meadow) D15 (plant detail: vigorous growth)

plant numbers: over 10 000 plants counted in 60 m X 100 m area (based on 25 square metre quadrats having about 500 plants); 85% with developing and mature inflorescences at early to mid flowering; population extends to NE and SW

note: associated with Muhlenbergia asperifolia (020815b); this population appears to extend around the northeastern shore for several hundred metres

habitat: drawdown lake nearshore and offshore subhygric alkaline sand with semiclosed meadow of 50-75% Distichlis stricta - **Carex parryana**; 5-20% Calamagrostis stricta - Potentilla anserina - SOIL (alkaline sand) - LITTER - Deschampsia cespitosa - Antennaria parvifolia - Agropyron trachycaulum subsp. trachycaulum; 1-5% Carex aurea; <1% Glaux maritima - Cirsium ?undulatum - Primula incana - Equisetum variegatum - Carex scirpoides - Poa ?pratensis - Cirsium flodmanii - Poa (species) - Sisyrinchium montanum - Rosa woodsii (seedling) - Salix maccalliana (seedling) - Crepis runcinata - Aster ?ericoides - Thermopsis rhombifolia - Puccinellia nuttalliana - Crepis tectorum

map/date site: **Cp12 - Carepar-020712c**

location: Wainwright Dunes Ecological Reserve; N side of David Lake, 1 km NE of peninsula's southern tip, about 35 m W of E boundary fence gate (see figure); NE9-2-42-5W4; see figure and map Cp12

lat./long.: (centre) 52°35.317'N / 110°36.308'W (0.025') (GPS)

collection: 020712c1 (1 replicate @ PP-4866 / rhizome / leaf: full / inflorescence: full / fruit: mature) photo: F8 (general habitat: drawdown lake offshore meadow, looking east at boundary fence, pink flags mark plants) F9 (habitat detail: drawdown lake offshore meadow)

plant numbers: 180 plants counted in 14 clusters in 10 m X 44 m area; 85% in mature inflorescence displaying early to mid-flowering to very early fruiting development

note: essentially level with slight hummock development; wetter during high lake level periods; further backshore is graminoid meadow and poplar forest

habitat: drawdown lake shore and nearshore subhygric alkaline sand with closed nearshore meadow of 50–75% Agropyron trachycaulum subsp. trachycaulum; 5–20% LITTER - Potentilla anserina - Juncus balticus - Deschampsia cespitosa; 1–5% Carex praticola - Carex aurea - **Carex parryana** - Sonchus uliginosus; <1% Glaux maritima - Symphoricarpos occidentalis - Taraxacum officinale - Crepis runcinata - Solidago canadensis - Salix petiolaris (seedling) - Primula incana - Sisyrinchium montanum

map/date site: Cp13 - Carepar-020815a

location: adjacent to Wainwright Dunes Ecological Reserve; David Lake, central eastern shore 1.3 km E of peninsula's southern tip; SW3-1-42-5W4; see map Cp13

lat./long.: (centre) 52°34.975N / 110°35.860'W (0.025') (GPS)

collection: 020815a1 (1 replicate / rhizome / leaf: full / inflorescence: full / fruit: mature)

photos: see also Aster pauciflorus photos; N1 (general habitat looking N) N2 (general habitat looking E at backshore thicket fringe) N3 N4 (detail of ground cover) N5 (general habitat looking NE toward backshore thicket fringe) N18 (general habitat)

plant numbers: well over 500 plants counted in 54 m X 300 m area; 85% in developing to mature inflorescence having 60 - submature flowers and 20% mature flowers

note: associated with Muhlenbergia asperifolia and Aster pauciflorus; occurs in a band about 75 m offshore (to NW) from lake backshore thicket along high water level; band is about 54 m broad and apparently does not extend further out into the drawdown basin; to the backshore side is a meadow of Hordeum jubatum - Potentilla anserina - Glaux maritima - Agropyron trachycaulum subsp. trachycaulum - Juncus balticus, and to the lakeward side is the closed lake basin meadow of Hordeum jubatum - Glaux maritima - Muhlenbergia asperifolia - Sonchus uliginosus - Atriplex prostrata habitat: drawdown lake basin nearshore subxeric alkaline sand supporting semiclosed to semiopen graminoid meadow of 5-20% Glaux maritima - SOIL (alkaline sand) - LITTER; 1-5% Aster pauciflorus - Muhlenbergia asperifolia - Juncus balticus - **Carex parryana**; <1% Agropyron trachycaulum subsp. subsecundum - Potentilla anserina - Hordeum jubatum - Puccinellia nuttalliana - Ranunculus cymbalaria - Aster ericoides - Agropyron trachycaulum subsp. trachycaulum - Sonchus uliginosus

map/date site: **Cp14 - Carepar-020817a**
location: Wainwright Dunes Ecological Reserve; N side of David Lake on east side of peninsula, 550 m NNE of peninsula's southern tip; SW10-2-42-5W4; see figure and map Cp14
lat./long.: (centre) 52°35.276'N / 110°36.718'W (0.025') (GPS)
UTM27: (centre) 12N 0526290E 5826260N (30m) (GPS)
collection: none
photo: none
plant numbers: ten plants counted in two clusters observed, approximately 100 m apart
note: associated with Aster pauciflorus (020817a-i); 85 m off midportion of grove, half way to berm; more plants in this offshore habitat notes in July 2002, but not refound due to late season of plants, drought and grazing; photo N21 (closeup of habitat)
habitat: drawdown lake offshore subhygric alkaline sand with semiclosed grazed meadow of 20-50% SOIL (sand); 5-20% LITTER - Glaux maritima; 1-5% Agropyron trachycaulum subsp. trachycaulum - Potentilla anserina - Aster pauciflorus; <1% Juncus balticus - Puccinellia nuttalliana - **Carex parryana**

map/date site: **Cp15 - Carepar-020817d**
location: Wainwright Dunes Ecological Reserve; NW side of David Lake, along E side of peninsula, 500 m NE of peninsula's southern tip; SE7-2-42-5W4 & 3-2-42-5W4; see figure and map Cp15
lat./long.: (centre) 52°35.243'N / 110°36.732'W (0.025') (GPS)
UTM27: (centre) 12N 0526219E 5826224N (30m) (GPS)
collection: none
photos: N25 P1 (general habitat: drawdown lake nearshore hummock terrain, pink flags mark plant groups, see also Muhlenbergia asperifolia) P2 (habitat detail: drawdown lake nearshore hummock terrain, scale to ruler)
plant numbers: 355 plants counted in 17 clusters in 35 m X 200 m area; 85% with mature

inflorescences at late to old fruiting development

note: occurs with Muhlenbergia asperifolia (020817b-vi, 020817c)

habitat: drawdown lake nearshore submesic alkaline sand with closed low meadow of 50-75% Potentilla anserina - Agropyron trachycaulum subsp. trachycaulum; 5-20% LITTER - Juncus balticus - **Carex parryana** - SOIL (alkaline sand) - Glaux maritima; 1-5% Hordeum jubatum - Muhlenbergia asperifolia; <1% Muhlenbergia richardsonis - Aster ericoides - Senecio pauperculus - Symphoricarpos occidentalis (seedling) - Agrostis scabra - Antennaria parvifolia - Potentilla pensylvanica - Gentiana amarella - Cirsium flodmanii - ?Suaeda calceoliformis (possibly Aster brachyactis)

map/date site: Cp16 - Carepar-020818a

location: Wainwright Dunes Ecological Reserve; northwestern side of David Lake, vicinity of southern tip of peninsula, 100 m SE of peninsula's southern tip; NW2-2-42-5W4; see figure and map Cp16

lat./long.: (centre) 52°34.980'N / 110°36.904'W (extends between 52°35.997'N / 110°36.808'W on NE side and 52°35.980'N / 110°36.904'W on SW side) (0.025') (GPS)

UTM27: (centre) 12N 0526082E 5825736N (extends between 12N 0526123E 5825768N on NE end, and 12N 0526082E 5825736N on SW end) (30m) (GPS)

collection: none

photos: none

plant numbers: 20 plants counted in 3 groups in 45 m X 110 m area; 85% in mature inflorescence with mature fruits

note: associated with Muhlenbergia asperifolia (020818b) and Aster pauciflorus (020818a); essentially flat and level; much wetter during high lake level periods; habitat continuous with backshore meadow

habitat: drawdown lake nearshore subhygric to mesic alkaline sand with very open to open meadow of 50-75% LITTER - SOIL (alkaline sand); 5-20% Scirpus pungens - Glaux maritima - Juncus balticus; 1-5% Potentilla anserina - Antennaria parvifolia - Muhlenbergia asperifolia - Aster ericoides - Sonchus uligniosus; <1% Aster pauciflorus - Potentilla pensylvanica - Carex (species) - **Carex parryana** - Cirsium flodmanii

map/date site: Cp17 - Carepar-020818c

location: Wainwright Dunes Ecological Reserve; NW side of David Lake, S and SE sides of peninsula 100 m from peninsula's southern tip; 2 locations; NW2-2-42-5W4; see figure and map Cp17

lat./long.: (two proximate locations) 52°34.970'N / 110°36.956'W and

52°35.001'N / 110°36.895'W (0.025') (GPS)
UTM27: (two proximate locations) 12N 0526023E 5825717N and 12N 0526094E 5825744N (30m) (GPS)

collection: none

photo: none

plant numbers: 732 plants counted in a 15 m X 230 m area in two groups (700 in 12 m X 15 m; 32 in 1 m X 9 m areas); 85% in mature fruiting inflorescence

note: associated with Aster pauciflorus (020818a) and Muhlenbergia asperifolia (020818b)

habitat: drawdown lake nearshore subhygric to mesic alkaline sand with closed graminoid meadow of 5-20% LITTER - Juncus balticus - Antennaria parvifolia - Potentilla anserina - **Carex parryana** - SOIL (alkaline sand) - Scirpus pungens; 1-5% Glaux maritima - Agropyron trachycaulum subsp. subsecundum - Sonchus uliginosus; <1% Muhlenbergia asperifolia - Fragaria virginiana - MOSS - Cirsium flodmanii - Taraxacum officinale - Deschampsia cespitosa - Artemisia frigida

Photos: Photographs of habitats and plant locations for *Carex parryana* in the Wainwright Dunes Ecological Reserve

- Cp4—Carepar-020613e
  - A26 (habitat detail: now-subxeric seepage slope hummock site, scale to pen)
  - A28 (habitat detail: now-subxeric seepage slope hummock site, scale to pen)
  - A27 (general habitat: now subxeric seepage slope hummock meadow, scale to clipboard, potential habitat for Gentiana fremontii)

- Cp5—Carepar-020614a
  - A29 (general habitat: drawdown lake offshore alkaline marsh)
  - A30 (habitat detail: drawdown lake offshore alkaline marsh)

- Cp6—Carepar-020614b
  - A31 (general habitat: extensive subxeric grassland and drawdown lake nearshore meadow, blue flags mark plants)
  - A32 (habitat detail: drawdown lake nearshore meadow)
  - A33 (general habitat: extensive subxeric grassland and drawdown lake offshore meadow)
  - A34 (habitat detail: drawdown lake nearshore subhygric grassland, scale to pen)

- Cp10—Carepar-020710b
  - D12 (general habitat: drawdown lake nearshore alkaline meadow, pink flags

mark plants)

- D13 (habitat detail: drawdown lake nearshore alkaline meadow, scale to ruler)

- Cp11—Carepar-020710c
    - D14 (general habitat: drawdown lake offshore meadow)
    - D16 (general habitat: drawdown lake offshore meadow)
    - D15 (plant detail: vigorous growth)
    - Cp12—Carepar-020712c
    - F8 (general habitat: drawdown lake offshore meadow, looking east at boundary fence, pink flags mark plant groups)
    - F9 (habitat detail: drawdown lake offshore meadow)

- Cp13—Carepar-020815a (see also photos for Aster pauciflorus)
    - N1 (general habitat looking N)
    - N2 (general habitat looking E at backshore thicket fringe)
    - N3 (detail of ground cover
    - N4 (detail of ground cover)
    - N5 (general habitat looking NE toward backshore thicket fringe)
    - N18 (general habitat)

- Cp15—Carepar-020817d (see also photos for Muhlenbergia asperifolia)
    - N25 (general habitat: drawdown lake nearshore hummock terrain, pink flags mark plants)
    - P1 (general habitat: drawdown lake nearshore hummock terrain)
    - P2 (habitat detail: drawdown lake nearshore hummock terrain, scale to ruler)

Cyperus schweinitzii Torr.—**sand nut-grass—CYPERACEAE**

This distinctive perennial graminoid of dry sand, active sand dune sites has a provincial Rank of **S2** in Alberta, and a global Rank of **G5** (Vujnovic & Gould 2002, ANHIC 2002). It has a rhizome that produces corm-like thickenings at its tip, with narrow, scabrous, 2 to 10 cm long basal and lower culm leaves. The culms are scabrous and triangular and are 10 to 70 cm tall, with several leafy bracts at its top, and several inflorescences on subsessile to 10 cm long branches. Each inflorescence tipped with a dense cluster of 1 cm long spikelets that have alternately-arranged, acuminate, brownish scales and small, hard, brown achenes. There literally is no other medium-height plant in Alberta that resembles this species, except perhaps for certain members of the genus *Scirpus*, which have a round to oval-shaped spikelet arrangement rather than the regimented planar array of alternate florets that are evident in the genus *Cyperus*. Its nearest relative is a more eastern species, *Cyperus houghtonii* that does not enter Alberta, and which has a slightly smaller growth habit, obtusely angled, smooth culms, smooth leaves, and obtuse scales. In its vegetative state it initially may be mistaken for *Carex pensylvanica*, but that species differs in having very fibrillose rhizomes. In the early summer, the plants of this species may readily be recognized by the accumulation of the previous several years' old culms and inflorescences that form a greying carpet of detritus at the plant bases, creating a somewhat dingy aspect to the lower slopes and bases of the sand dune blowouts. The drought conditions did not appear to greatly affect the growth of this species during the 2002 survey of the Reserve, understandably, since it is a very dry habitat species. This plant often occurred in a general association with the rare *Shinneroseris rostrata*, and perhaps also with *Carex houghtoniana* and *Chenopodium leptophyllum*.

This species occurs in seven provinces from Alberta to Quebec and in 29 states from New England to Texas and the central and mid-western states. It also is rare in Manitoba and Saskatchewan and in eight states including Montana (NatureServe 2003). It occurs in southeastern Alberta with 14 very isolated known locations in the Grassland and Parkland Natural Regions (Kershaw *et al.* 2001, ANHIC 2003). The location at Wainwright Dunes Ecological Reserve appears to have the only known concentration in the eastern Parkland (Kershaw *et al.* 2001). The species was previously recorded from here by Fehr (1984), Cottonwood Consulting, Ltd. (1986) and Derek Johnston (1992) who together discovered ten locations, with all but one from within the Reserve boundaries. The 2002 survey rediscovered two of these general locations, and added an additional three general clusters with an additional 16 species locations. These were all associated with the eroded dune ridge landforms and were located as clusters about 2 km west of David Lake, 800 m, 2 km, 2.5 km and 3 km northwest of the lake, 2 km north northwest, and 1 km and 2 km north of the lake.

The number of plants of this species that were counted in 2002 within the Ecological

Reserve's boundaries totaled 9 123 plants in the four clusters of 15 sites that were sampled. The number of plants the varied from 35 to over 3 000 individual basal leaf clusters with associated culms with inflorescences in areas of from 3 m X 7 m, to 30 m X 85 m. Unfortunately, none of the previous records for the species included population information, except the indications of "very rare". In most cases, the leaf clusters were in fact connected by rhizomes, with at least five per rhizome, and these plants formed a semiopen to semiclosed, low graminoid cover on the blowout sand habitat. In 2002, the plants started to develop leaves in late May to early June, and the leaves were at least half developed by mid-June, and fully developed by mid-July. The culm started to develop by mid-June, and was fully extended by mid-July, and the inflorescence probably was initiated by late June and was mature by mid- to late July. The flowering phase appeared to initiate in early July and continued through mid-July to essentially end by late July. Submature fruits were present by the third week in July and mature fruits were prevalent by mid- to late August. In only one location did the entire group of plants not produce any inflorescences; in all the rest at least 50% to 70% of the plants were fertile. As indicated above, the bases of the sandy blowout slopes had notable accumulations of the old inflorescences, and presumably fruits, from the previous years. With the additional moisture and litter, these conditions may provide an opportunity for successful seed germination and seedling survival success.

The sole habitat that this species occupied within the Reserve was the xeric to subxeric, semiactive, semiopen to open sand in the middle to lower slopes of the erosion faces on the southwestern-facing sides of the sand dune ridges. The populations often formed a semiopen cover in association with other dune habitat species, notably *Calamovilfa longifolia, Carex pensylvanica* var. *digyna, Koeleria macrantha, Carex obtusata, Carex siccata, Festuca saximontana, Stipa curtiseta, Helianthus couplandii, Heterotheca villosa, Artemisia campestris,* the moss *Tortula ruralis* and others, including the provincially rare *Shinneroseris rostrata* and *Chenopodium leptophyllum*, and possibly also *Carex houghtoniana*. The lower slope and the ridge slope draw habitats tended to have a somewhat denser concentration of plants and appeared to initiate their growth earlier in the season; this may have been due to increased soil moisture along the slope base zone. It was not until the mid-summer survey period that plants were noted along the mid- to lower slopes, although by then these often appeared to have formed semiopen to semiclosed covers at the same phenological development stage as at the slope bases. The blowout basins tended to have relatively closed meadows of the *Calamovilfa longifolia, Koeleria macrantha,* and other associated species, including often very closed carpets of *Hudsonia tomentosa* and several species of lichen, notably *Cladonia mitis, Cetraria ericetorum, Caldonia uncialis, Cornicularia aculeata* and others. However, the population of the *Cyperus* appeared to avoid extending into these more stablized, closed carpets and meadows.
There were no immediate habitat threats to the populations in the reserve. Associated

with the sand dune ridge blowout situations were wind-caused erosion and deposition, although only two groups of the species were developed on actively depositing sand and appeared to be maintaining their growth, and no populations appeared to be seriously eroding. Nevertheless, at one location there were signs of recent unauthorized all terrain vehicle ("quad") use in the blowouts, and this may impose an occasional local threat. Additionally, one very local population (Cs26) was not producing any fruits in 2002, although, judging from the previous year's accumulation of productive culms and inflorescences, there was normal production in 2001; this may indicate a failing population, but the situation was by no means typical of anywhere else in the Reserve.

Management considerations for maintaining the species in the reserve at this time should include monitoring the size and vigor at the known plant locations. As well, a further survey should include the discovery of additional locations for the plants, since probably only about half of the blowouts in the Ecological Reserve could be examined during the 2002 survey. Measures should be taken to discourage unauthorized off-road vehicle use in the area, particularly in the vicinity of active sand sites.

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Cyperus schweinitzii* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	wind (2), insulation (3)
Flood Hazard	not apply
Soil Drainage	rapidly drained (2), well-drained (3)
Perviousness	rapidly (1)
Site: Macro	not apply
Site: Meso	mid-slope (3), lower slope (4), toe (5)
Site: Micro	straight (1)
Site: Surface Shape	concave (2)
Ecological Moisture Regime	very xeric (1), xeric (2), subxeric (3)
Nutrients	?submesotrophic (2)
Successional Status: 1	pioneer (1)
Successional Status: 2	not apply
Disturbance Factors	not apply

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	late June to mid-July
Phenology: reproductive – inflorescence	late June to mid July
Phenology: reproductive – flower	early to mid- to late July
Phenology: reproductive – fruit	mid- to late July, and early to mid-August
Habitat Threats	wind erosion and drifting, recreation
Management Considerations	monitoring populations and drought impacts

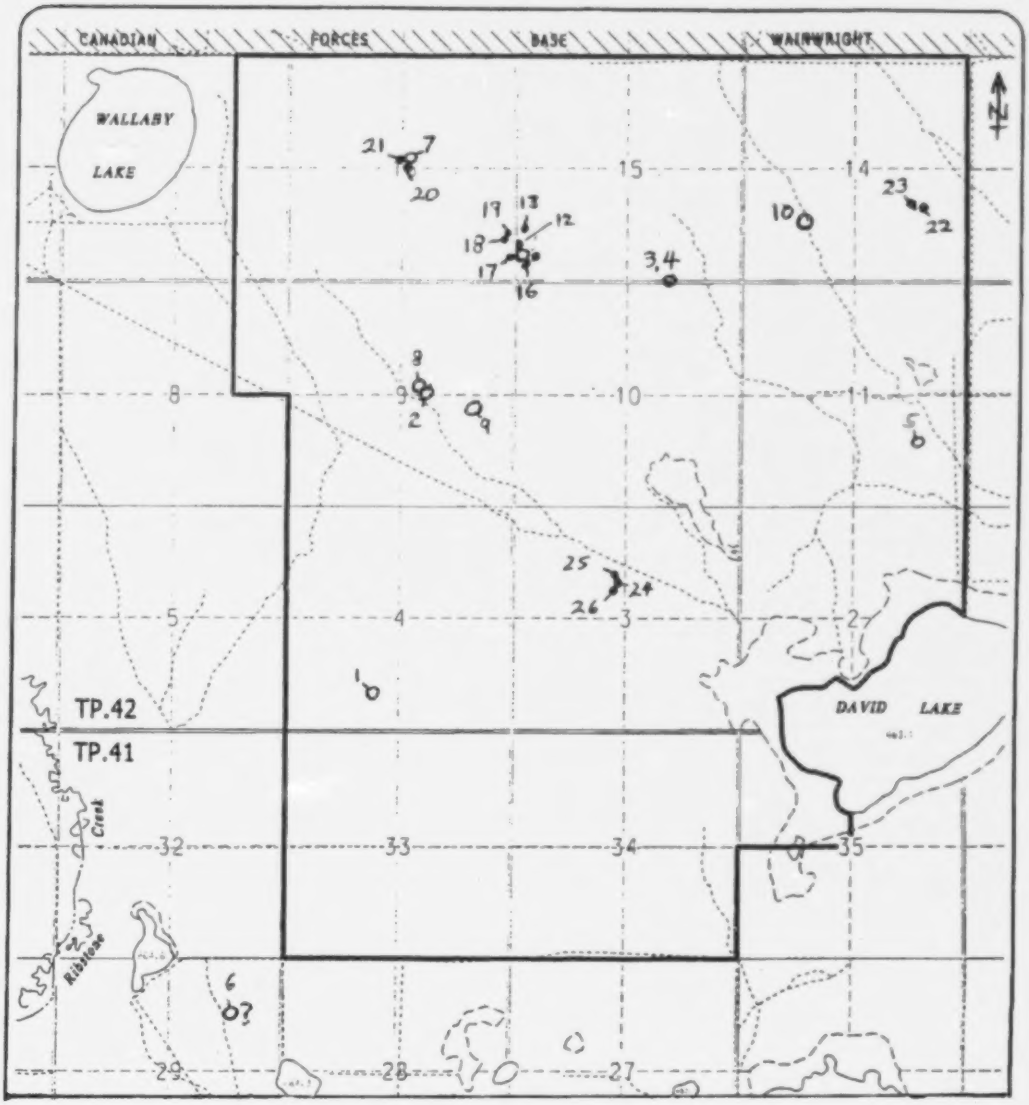
Species location summary for *Cyperus schweinitzii* in the Wainwright Dunes Ecological Reserve (+ indicates site outside reserve boundary)

map site / date site	location coordinates	number (size)	habitat
Cs1 - Cypesch-830623a	UTM27 522600E 5825600N	no information	active sandy blowout
Cs2 - Cypesch-830623b	UTM27 522900E 5827780N	no information	active blowout - dry sandy soil
Cs3 - Cypesch-830717a	UTM27 524600E 5828550N	no information	blowout in grassland
Cs4 - Cypesch-830717b	UTM27 524600E 5828550N	no information	blowout in grassland
Cs5 - Cypesch-830726a	UTM27 526400E 5827450N	no information	well drained S side of dunes
+Cs6 - Cypesch-86xxxxa	NE29-41-5W4	no information	active dune blowouts
Cs7 - Cypesch-86xxxxb	52°36.990'N 110°39.750'W	no information	active dune blowouts
Cs8 - Cypesch-86xxxxc	52°36.600'N 110°39.050'W	no information	active dune blowouts
Cs9 - Cypesch-86xxxxd	52°36.050'N 110°39.400'W	no information	active dune blowouts
Cs10 - Cypesch-86xxxxe	52°36.750'N 110°37.300'W	no information	active dune blowouts
Cs11 - Cypesch-920729a	?UTM27 526400E 5827450N?	no information	active dune blowouts
Cs12 - Cypesch-020616c	52°36.651'N 110°39.094'W	1 210 (20m X 45m)	dune ridge slope semiactive blowout
Cs13 - Cypesch-020616d	52°36.742'N 110°39.062'W	620 (12m X 30m)	dune ridge slope semiactive blowout
Cs14 - Cypesch-020616e	52°36.885'N 110°39.288'W	53 (8m X 40m)	dune ridge slope semiactive blowout
Cs15 - Cypesch-020714f	52°36.729'N 110°38.998'W	192 (30m X 50m)	dune ridge slope semiactive blowout
Cs16 - Cypesch-020715c	52°36.600'N 110°39.050'W	314 (25m X 65m)	dune ridge slope semiactive blowout
Cs17 - Cypesch-020716b	52°36.617'N 110°39.082'W	281 (5m X 15m)	dune ridge semistable blowout
Cs18 - Cypesch-	52°36.641'N 110°39.105'W	680	dune ridge

map site / date site	location coordinates	number (size)	habitat
020716c		(12m X 15m)	semiactive blowout
Cs19- Cypesch-020716d	52°36.665'N 110°39.085'W	3 030 (30m X 85m)	dune ridge slope semiactive blowout
Cs20- Cypesch-020716f	52°36.964'N 110°39.789'W	955 (22m X 70m)	dune ridge semiactive blowout upper slope blowout
Cs21 - Cypesch-020716i	52°36.996'N 110°39.827'W	210 (5m X 10m)	dune ridge semiactive bloweout lower slope & basin
Cs22- Cypesch-020717a-i	52°35.828'N 110°36.451'W	640 (18m X 55m)	dune ridge slope active blowout
Cs23 - Cypesch-020717a-ii	52°35.832'N 110°38.491'W	230 (6m X 70m)	dune ridge slope semiactive blowout
Cs24 - Cypesch-020719g	52°35.363'N 110°38.548'W	580 (28m X 32m)	dune ridge slope semiactive to semistable blowout
Cs25 - Cypesch-020719h	52°35.375'N 110°38.534'W	35 (3m X 7m)	dune ridge slope semiactive to semistable blowout
Cs26 - Cypesch-020719i	52°35.339'N 110°38.519'W	93 (2.5m X 8m)	dune ridge slope semiactive blowout

Photo: *Cyperus schweinitzii* (Sand nut-grass) plant detail: growth habit (Cs16—Cypesch-020715c - H2, photo Ian D. Macdonald)

Map: Species locations for *Cyperus schweinitzii* in the Wainwright Dunes Ecological Reserve (o indicates approximate reported location)


CANADIAN FORCES BASE WAINWRIGHT
WALLABY LAKE
DAVID LAKE
TP.42
TP.41
Creek
Ribstone
N
15
14
8
10
11
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26
1
6
?

PREVIOUSLY REPORTED SPECIES LOCATIONS

map/date site: Cs1 - Cypesch-830623a

location: Wainwright Dunes Ecological Reserve // David Lake // UTM27 522600E 5825600N // lat./long.: 52°35'N / 110°40'W // see map Cs1 // see comment

source: ANHIC // Element Occurrence PMCYP06360 # 004

reference: Fehr, A. 1984. Wainwright Study Area: A Biophysical Inventory. Alberta Energy and Natural Resources

observation: Fehr, A. 23 June 1983

collection: 1983-06-23 // Fehr, A. & S. Charbonneau // PM# B86.17.75 // ID-OK // specimen source code S83FEHPMABCA010

photo: none

plant numbers: no information

note: remains of last year's plants (includes panicle)

habitat: "active sandy blowout" // elev. 645m approx. 35m

comment: this location is 3.3 km W of the David Lake peninsula's southern tip

map/date site: Cs2 - Cypesch-830623b

location: northwest of Wainwright Dunes Ecological Reserve boundaries // Wallaby Lake // UTM27 523000E 5827750N // see map Cs2 // see comment

source: ANHIC // Element Occurrence PMCYP06360 # 005

reference: Fehr, A. 1984. Wainwright Study Area: A Biophysical Inventory. Alberta Energy and Natural Resources source code R84FEH01ABCA

observation: Fehr's vegetation plot AF83017

collection: 1983-06-23 // Fehr, A. & S. Charbonneau s.n. // PP# 619 // K. E. Tannas // vidi & stet IDM-02 // specimen source code S83FEHPPABCA06

photo: none

plant numbers: very rare

note: none

habitat: "active blowout - dry sandy soil" // 685 m // see comment

comment: not actually within Wainwright Dunes Ecological Reserve boundaries; specimen examined at Provincial Parks herbarium indicate that this collections from "stand 17 - active blowout"; specimen says "David Lake", but does not indicate Wallaby Lake; specimen presents the previous year's vigorous clum and inflorescence and present year's culm and inflorescence at subanthesis at 60% formed inflorescence; habitat is given as "very dry sandy soil"

interpretation of Fehr 1984 vegetation plot data for Study Area ID 017: location in Wainwright Dunes Ecological Reserve; ca 3.6 km NW of David Lake peninsula's southern tip; UTM27 522900 5827780 (50 m) (map); 7-9-

42-5W4
population is rare, here it is infrequent
habitat is sand dune blowout (pitted valley floor) with very xeric mineral soil supporting barrens meadow of LOW SHRUB: (1% - extremely open) Prunus virginiana (1%); HERB: (30% - semiopen) SOIL (mineral) (90%) - Calamovilfa longifolia (10%) - **Cyperus schweinitzii** (10%) - SOIL (humus (5%) - Koeleria macrantha (5%) - Elymus canadensis (5%) - LITTER (3%) - Oryzopsis hymenoides (3%) - Artemisia campestris (1%) - Festuca saximontana (1%) - Erysimum inconspicuum (0.5%) - Potentilla (species) (0.5%) - Heterotheca villosa (0.5%) - Carex obtusata (0.1%)

map/date site: Cs3 - Cypesch-830717a
location: Wainwright Dunes Ecological Reserve // David Lake area // UTM27 524600E 5828550N // see map Cs3 // see comment
source: ANHIC // element Occurrence PMCYP06360 # 006
reference: Fehr, A. 1984. Wainwright Study Area: A Biophysical Inventory. Alberta Energy and Renewable Resources // document source code R84FEH01ABCA
observation: Fehr's vegetation plot AF83007
collection: 1983-07-17 // Fehr, A. // PP# 660 // ID-??
photo: none
plant numbers: no information
note: —
habitat: blowout in grassland // 678 m
comment: specimen not located at the Alberta Provincial Parks herbarium; the ANHIC data base location UTM27 is situated in a wetland basin, 3 km NNW of the David Lake peninsula's southern tip

map/date site: Cs4 - Cypesch-830717b
location: Wainwright Dunes Ecological Reserve // David Lake area // UTM27 524600E 5828550W // see map Cs4 // see comment
source: ANHIC // Element Occurrence PMCYP06360 # 006
reference: Fehr, A. 1984. Wainwright Study Area: A Biophysical Inventory. Alberta Energy and Renewable Resources. // document source code R84FEH01ABCA
observation: vegetation plot AF83007
collection: 1983-07-17 // Fehr, A. // PP# 620 // det: T.E. Tannas // vidi & stet IDM-02
photo: none
plant numbers: no information except for "rare"
note: —
habitat: blowout in grassland; rare, dry sand soil and dunes // 678 m

comment: specimen located at the Alberta Provincial Park herbarium indicated this from vegetation site 07, but Fehr 84 reference not indicated Cyperus from the community sample data; specimen label indicates SE9-42-5W4; specimen indicates inflorescence with mid- to late flowers and submature fruits; this location is 3.3 km W of the David Lake peninsula's southern tip

map/date site: Cs5 - Cypesch-830726a
location: Wainwright Dunes Ecological Reserve // David Lake // UTM27 526400E 5827450N // see map Cs5 // see comment
source: ANHIC // Element Occurrence PMCYP06360 # 001
reference: Fehr 1984
observation: —
collection: 1983-06-23 // Fehr, A. & T.S. Bakshi // AU# 83-0521 // ID-OK // specimen source code S83FEHAUABCA02
1983-07-26 // Fehr, A. & S. Charbonneau s.n. // PP# 621 // det: K.E. Tannas
photo: none
plant numbers: no information
note: none
habitat: well drained, south side of dunes // 685 m
comment: Fehr & Charbonneau specimen at Provincial Parks herbarium (PP# 621) examined; stet IDM-02; location in label as SE11-42-5W4, which would be approximately 1.5 km N of David Lake central north shore and 1.8 km NNE of the David Lake peninsula's southern tip; habitat as south side of dunes; specimen with inflorescence and immature fruits; notes indicate very rare - sand dunes - SE Alberta

map/date site: Cs6 - Cypesch-86xxxxa
location: from active blowouts on the dunes in the study area's southwestern corner // see map Cs6
source: Cliff Wallis
reference: Cottonwood Consultants, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton AB.
observation: C. Wallis (?) / A. Fehr (?)
collection: no information
photo: no information
plant numbers: no information
note: actual source of sighting unclear
habitat: active dune blowouts
comment: this general location indicated on the Cottonwood Consultants, Ltd. 1986

Significant Features map

map/date site: Cs7 - Cypesch-86xxxxb
location: Wainwright Dunes Ecological Reserve; 4.7 km NW of David Lake peninsula; 52°36.990'N / 110°39.750'W; see map Cs7
source: Cliff Wallis
reference: Cottonwood Consultants, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton AB.
observation: C. Wallis
collection: no information
photo: no information
plant numbers: no information
note: none
habitat: active dune blowouts
comment: this general location indicated on the Cottonwood Consultants, Ltd. 1986. Significant Features map

map/date site: Cs8 - Cypesch-86xxxxc
location: Wainwright Dunes Ecological Reserve; 3.8 km NW of David Lake peninsula; 52°36.600'N / 110°39.050'W; see map Cs8
source: Cliff Wallis
reference: Cottonwood Consultants, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton AB.
observation: C. Wallis
collection: no information
photo: no information
plant numbers: no information
note: none
habitat: active dune blowouts
comment: this general location indicated on the Cottonwood Consultants, Ltd. 1986. Significant Features map

map/date site: Cs9 - Cypesch-86xxxxd
location: Wainwright Dunes Ecological Reserve; 3.3 km NW of David Lake peninsula; about 52°36.050'N / 110°39.400'W; see map Cs9
source: Cliff Wallis
reference: Cottonwood Consultants, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton AB.
observation: C. Wallis

collection: no information
photo: no information
plant numbers: no information
note: none
habitat: active dune blowouts
comment: this general location indicated on the Cottonwood Consultants, Ltd. 1986 Significant Features map

map/date site: Cs10 - Cypesch-86xxxxe
location: Wainwright Dunes Ecological Reserve; 3.2 km N of David Lake peninsula; about 52°36.750'N / 110°37.300'W; see map Cs10
source: Cliff Wallis
reference: Cottonwood Consultants, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton AB.
observation: C. Wallis
collection: no information
photo: no information
plant numbers: no information
note: none
habitat: active dune blowouts
comment: this general location indicated on the Cottonwood Consultants, Ltd. 1986 Significant Features map

map/date site: Cs11 - Cypesch-920729a
location: Wainwright Dunes Ecological Reserve; no information
source: ANHIC data base PMCYP06360
reference: —
observation: J.D. Johnson 29 July 2001
collection: 1992-07-29 // Johnson, J.D. s.n. // CF# 930287 // ID-OK // species source code S92JOHCFABCA03
photo: no information
plant numbers: no information
note: none
habitat: active dune blowouts
comment: ANHIC data base gave no location information; specimen not examined

RECENTLY DISCOVERED SPECIES LOCATIONS

map/date site: Cs12 - Cypesch-020616c
location: Wainwright Dunes Ecological Reserve; 3.6 km NW of David Lake peninsula's southern tip; NW4-15-42-5W4; see figure and map Cs12

lat./long.: (centre) 52°36.651'N / 110°39.094'W (0.025') (GPS)

collection: 020616a5 (1 voucher @ PP / young plant / root / rhizome / bulb / leaf: 1/3 developed, 14–18 cm / inflorescence: not yet developed / old inflorescence & fruit: 15-30 cm)

photos: B18 (general habitat: sand dune blowout slope, looking NW) B20 (general habitat: sand dune blowout slope, looking SE, scale to backpack, blue flags mark plants) B21(general habitat: sand dune blowout slope base, dark tone at base is previous years' dead inflorescences, blue flags mark individual plants) B22 (habitat detail: young foliage and previous years' dead inflorescences at sand dune blowout slope base, scale to pen) C18 (habitat detail: base of sand dune blowout slope, note green foliage concentration) C19 (habitat detail: sand dune blowout slope, plants extend from base of dune ridge blowout to about half to 2/3 up toward crest)

plant numbers: 1 210 plants counted in 20 m X 45 m area with 2 groups of 23 clusters (SE basin: 1050 plants counted in 17 m X 35 m, NW basin: 160 plants counted in 5 m X 10 m); this is the count of the 2001 population from old inflorescences; (see figure)

note: slope base has <30% cover, mid-slope has <10% cover; the current year's plant growth has foliage with yellow-green, narrow leaves, surrounded by a dense mat of the previous years' culms at their bases, giving the site a dingy grey appearance

habitat: sand dune ridge south-facing blowout erosion slope with sand barrens of 75–50% SOIL (sand); 20–50% LICHEN; 5–20% Calamovilfa latifolia; 1–5% Festuca saximontana – **Cyperus schweinitzii** – MOSS; <1% Carex ?siccata – Koeleria macrantha map/date site: Cs13 – Cypesch-020616d

location: Wainwright Dunes Ecological Reserve; 3.6 km NW of David Lake peninsula's southern tip; NW4-15-42-5W4; see figure and map Cs13 lat./long.: (centre) 52°36.742'N / 110°39.062'W (0.025') (GPS)

collection: none

photo: B23 (plant population: in sand dune blowout, note grey strip at base of slope is the Cyperus schweinitzii's dead culm accumulations from previous years, scale to backpack)

plant numbers: 620 plants counted in 12 m X 30 m area; plants at base and lower half and basin of blowout

note: none

habitat: sand dune ridge semiactive blowout erosion slope (3°—35° toward 230° – SSW) with open xeric sand barrens of 75–50% SOIL (sand); 50–75% Sporobolus cryptandrus; 5–20% Calamovilfa longifolia – **Cyperus schweinitzii**; 1–5% Carex (species) – Rumex venosus – LICHEN; <1%

Houstonia tomentosa - Festuca saximontana - Oryzopsis hymenoides

map/date site: Cs14 - Cypesch-020616e
location: Wainwright Dunes Ecological Reserve; 3.6 km NW of David Lake peninsula's southern tip; NW4-15-42-5W4; see figure and map Cs14 lat./long.: (centre) 52°36.885'N / 110°39.288'W (0.025') (GPS)
collection: 020616a6 (1 replicate (specimen missing?) / young plants / root / bulb / rhizome / leaf: submature, 20 cm / culm: young, 15 cm / inflorescence: 1/3 developed / flower: young / with old 2001 inflorescence and fruit)
photos: B24 (general habitat: sand dune blowout slope, population along mid- to lower slope) B25 (general habitat: sand dune blowout slope, SE end, blue flags mark population along mid- to lower slope) C20 C21 (plant detail: plant in situ, note previous year's culm and inflorescence, scale to pen)
plant numbers: 53 plants counted in 8 m X 40 m area; population at base and lower third of blowout erosion face; this is 2001 individual plant count based on previous year's dead culms; plants have new leaves 10 cm long over previous year's dead culms
note: none
habitat: sand dune ridge semiactive erosion slope (15° toward 260° - WWSW) (blowout basin semistabilized by Hudsonia tomentosa) with semiopen xeric sand barrens of 75-50% SAND; 50-75% Calamovilfa longifolia; 5-20% Koeleria macrantha; 1-5% **Cyperus schweinitzii** - Festuca saximontana - MOSS; <1% LICHEN - Hudsonia tomentosa - Juniperus horizontalis - Poa sandbergii - Carex pensylvanica

map/date site: Cs15 - Cypesch-020714f
location: Wainwright Dunes Ecological Reserve; NW km 3.5 of David Lake peninsula's southern tip; SW4-15-42-5W4; see figure and map Cs15 lat./long,: (centre) 52°36.729'N / 110°38.998'W (0.025') (GPS)
collection: 020714f1 (2 replicates: UAC & ALTA / root / bulb / leaf: submidgrowth to mature, 15-30 cm / culm: 25 cm / bract: 9 cm / flower: submature to mature / old 2001 inflorescence and fruits)
photos: F18 F19 (general habitat: sand dune blowout slope base, pink flags mark plant boundary) E23 E24 E25 (detail of plants detail: plant growth habit with young inflorescences)
plant numbers: 192 plants counted in 30 m X 50 m area in three groups: 48 in 5 m X 9 m area at base of blowout system, 109 in 25 m X 25 m area in northeastern half of blowout basin, and 35 in 5 m X 10 m area in southeastern half of blowout basin
note: plant has the general appearance of Carex pensylvanica but is not as yellow-green toned; Hudsonia tomentosa concentrated at the base of

the slope, but the Cyperus schweinitzii seems to avoid establishing in it

habitat: sand dune ridge blowout semiactive erosion slope with open to very open active to semiactive sand barrens of 75–50% SOIL (sand); 1–5% Calamovilfa longifolia – Carex pensylvanica var. digyna – Carex obtusata; <1% **Cyperus schweinitzii** – Cetraria ericetorum – Festuca saximontana – Koeleria macrantha – Rosa acicularis – Heterotheca villosa – Hudsonia tomentosa – Chamaerhodos erectum – Juniperus horizontalis

map/date site: Cs16 – Cypesch-020715c

location: Wainwright Dunes Ecological Reserve; 3.5 km NW of David Lake peninsula's southern tip; SW4-15-42-5W4; see figure and map Cs16

lat./long.: (centre) 52°36.600'N / 110°39.050'W (west population at 52°36.590'N / 110°39.045'W, east population at 52°36.612'N / 110°39.058'W) (0.025') (GPS)

collection: 020715c1 (1 replicate @ ALTA / root / rhizome / bulb / leaf: submature, 23 cm / culm: submature, 20 cm / inflorescence: mature / flower: submature to mature)

photos: (see also photos for Shinneroseris rostrata); F23 (habitat : sand dune blowout slope, NW end of the blowout, pink flags mark plant boundary) F24 (general habitat: semistable sand dune blowout, pink flags mark plants on SE end of blowout) F25 G1 (habitat detail; semistable sand dune blowout, scale to ruler) H0 H4 (plant detail: mature inflorescence, mid-flowering to young fruit development) H1 H2 H3 (plant detail: growth habit)

plant numbers: 314 plants in 25 m X 65 m area in two groups: 122 plants (20 in current inflorescence) in 8 m X 12 m area in the blowout's southeastern half, and 192 (25 in current inflorescence) in 10 m X 26 m area in the blowout's northwestern half; population extends from near blowout base to two thirds up the slope; marking flag on aspen at the central southwestern part of the blowout basin

note: associated with Shinneroseris rostrata (020715d)

habitat: sand dune ridge blowout semistable erosion slope (semistabilized by Calamovilfa longifolia) with semiopen to open sand barrens of 50–75% SOIL (sand); 5–20% LITTER – Koeleria macrantha – Calamovilfa longifolia – Stipa curtiseta; 1–5% **Cyperus schweinitzii** – Carex pensylvanica var. digyna; <1% Helianthus couplandii - Elymus canadensis - Carex obtusata – Poa sandbergii – Cetraria ericetorum – LICHEN – Oryzopsis hyemalis

map/date site: Cs17 – Cypesch-020716b

location: Wainwright Dunes Ecological Reserve; 3.6 km NW of David Lake

peninsula's southern tip; SE1-16-42-5W4; see figure and map Cs17
lat./long.: (centre) 52°36.617'N / 110°39.082'W (0.025') (GPS)

collections: 020716b1 (upper slope plant / 1 replicate @ PP-4867 / root / rhizome / bulb / leaf: submature to mature, 20 cm / culm: submature, 20 cm / inflorescence: young to full mature / flower: young to submature to mature); 020716b2 (lower slope plant / 1 replicate @ ALTA / root / rhizome / bulb / leaf: young, 17 cm / culm: young, 10 cm / inflorescence: 40% developed / flower: young)

photo: G2 (general habitat: sand dune semistable blowout slope, pink flags mark plant boundary)

plant numbers: 281 plants counted in 8 m X 20 m area in two adjacent groups: 21 plants (18 with inflorescence, including 12 remains from 2001) counted in 1.5 m X 3 m area along slope base, and 260 plants (70% in inflorescence, 40% at full inflorescence development, including over culms remaining 70 from 2001) counted in 5 m X 15 m area along the erosion slope (base to crest)

note: associated with Shinneroseris rostrata (020715d) and Cyperus schweinitzii (020715e) just to the southeast

habitat: sand dune ridge blowout semistable erosion slope (24 ° toward 310 ° - NW) with very open xeric sand barrens of 50-75% SOIL (sand); 1-5% **Cyperus schweinitzii** - Calamovilfa longifolia - Carex pensylvanica - Carex obtusata; <1% Chamaerhodos erectum - Solidago missouriensis

map/date site: Cs18 - Cypesch-020716c

location: Wainwright Dunes Ecological Reserve; 3.6 km NW of David Lake peninsula's southern tip; NE1-16-42-5W4; see figure and map Cs18
lat./long.: (centre) 52°36.641'N / 110°39.105'W (0.025') (GPS)

collection: 020716c1 (1 replicate @ ALTA / root / rhizome / bulb / leaf: young to mature, 15-30 cm / culm: full, 25 cm / inflorescence: full / flower: submature to mature)

photos: G3 G4 (general habitat: sand dune semiactive blowout basin slope, pink flags mark plant boundary) H10 H11 H12 H13 (plant detail: growth habit with mature inflorescences at mid-flowering to young fruit)

plant numbers: 680 plants counted in 12 m X 15 m area; at least 70% with inflorescences, 10% now in full to preanthesis, and 20 culms remaining from 2001

note: none

habitat: sand dune ridge semiactive blowout basin slope (0°-3° toward 180° - S) with xeric open sand barrens of 50-75% SOIL (sand); 1-5% Cyperus schweinitzii; <1% Carex pensylvanica var. digyna - Carex siccta - LICHEN - LITTER - Calamovilfa longifolia - Oryzopsis hymenoides - Koeleria macrantha - Elymus canadensis - Helianthus couplandii - Heterotheca

map/date site: **Cs19 – Cypesch-020716d**

location: Wainwright Dunes Ecological Reserve; 3.6 km NW of David Lake peninsula's southern tip; NE1-16-42-5W4; see figure and map Cs19 lat./long.: (centre) 52°36.665'N / 110°39.085'W (0.025') (GPS)

collections: 020716d1 (1 replicate @ PP-4868 / root / bulb / leaf: young to mature, 15–30 cm / culm: mature, 20 cm / bract: 20 cm / inflorescence: full / fruit: submature to mature); 020716e1 (1 replicate @ ALTA / root / rhizome / bulb / leaf: mature, 18–25 cm / flower: immature to mature / with old fruits and culm)

photos: (see also photos for Shinneroseris rostrata); G5 G6 G7 G8 (general habitat: panorama series (right to left) of sand dune blowout basin, flags marking plant boundaries) G9 (habitat detail: sand dune blowout slope, scale to ruler) G10 G11 G12 (habitat detail: sand dune blowout base, pink flags mark plant boundaries)

plant numbers: 3 030 plants counted in 30 m X 85 m area; plants at slope base have thinner leaves with 15% having inflorescences, while those on the slope have broader leaves and 50% to 70% have inflorescences; plants extend from slope base to two thirds up erosion face, and locally almost to the slope crest

note: associated with Shinneroseris rostrata (020716e); many plants in broad basin and locally throughout the erosion slope face; plants avoid the Hudsonia tomentosa carpets in the blowout basin

habitat: sand dune ridge semiactive blowout slope (15°–35° toward 200° – SSW) with very open xeric sand barrens of 50–75% SOIL (sand); 5–20% LITTER; 1–5% Calamovilfa longifolia – Koeleria macrantha – **Cyperus schweinitzii** – Carex siccata – Carex pensylvanica var. digyna; <1% Festuca saximontana – MOSS – Carex obtusata – Equisetum variegatum – Elymus canadensis – Helianthus couplandii – Juniperus communis – Shinneroseris rostrata – Heterotheca villosa – LICHEN

map/date site: **Cs20 – Cypesch-020716f**

location: Wainwright Dunes Ecological Reserve; 4.8 km NW of David Lake peninsula's southern tip; SW10-16-42-5W4; see figure and map Cs20 lat./long.: (SE end) 52°36.964'N / 110°39.789'W (0.025') (GPS)

collection: 020716f1 (1 replicate @ ALTA / root / bulb / leaf: mature, 25 cm / culm: mature, 28–31 cm / flower: mature / fruits: young); 020716f2 (habitat 1 / 1 replicate @ ALTA / root / rhizome / leaf: full, 15 cm / plant vegetative / old 2001 inflorescence: 30 cm, and old fruit); 020716f3 (habitat 2 / 1 replicate @ ALTA / root / bulb / leaf: narrow, mature, 22 cm / culm: mature, 30 cm / flower: mature / fruit: immature) photo: (see also photos for Shinneroseris rostrata); G13 G14 G15 G16 (general habitat: panorama series (right to left), sand dune blowout basin and slope, pink flags mark upper and lower plant boundaries) G17 (habitat detail: sand dune blowout basin)

plant numbers: 955 plants counted in 22 m X 70 m area; 30% in inflorescence with mature flowers and early fruit; marked by pink ribbon on aspen

note: associated with Shinneroseris rostrata (020716h)

habitat 1: sand dune ridge (7 m tall) semiactive unstable blowout slope erosion face (24° to 40° toward 240° - WSW) with xeric sand barrens of 50-75% SOIL (sand); 5-20% LITTER - Calamovilfa longifolia - Carex pensylvanica var. digyna; 1-5% **Cyperus schweinitizii** - Carex lanuginosa (!!); <1% Koeleria macrantha - Stipa curtiseta - Carex siccata - Carex obtusata - Shinneroseris rostrata - Lygodesmia juncea

habitat 2: sand dune ridge semiactive unstable blowout slope base (24° toward 240° - WSW) xeric sand barrens of 20-50% SOIL (sand) - LITTER; 5-20% **Cyperus schweinitzii**; 1-5% Carex siccata; <1% Carex pensylvanica var. digyna - Juniperus horizontalis - Carex obtusata - Calamovilfa longifolia

map/date site: Cs21 - Cypesch-020716i

location: Wainwright Dunes Ecological Reserve; 4.8 km NW of David Lake peninsula's southern tip; SE11-16-42-5W4; see figure and map Cs21 lat./long.: (centre) 52°36.996'N / 110°39.827'W (0.025') (GPS)

collection: none

photo: G23 (general habitat: sand dune ridge blowout slope, pink flags mark plants)

plant numbers: 210 plants counted in 5 m X 10 area; 95% with inflorescences, one third expanded as mature flowers; marked by pink ribbon on juniper shrub on NW side

note: many coyote tracks in the vicinity

photo: G23 (general habitat: sand dune blowout lower slope, pink flags mark population boundary)

habitat: sand dune ridge semiactive blowout lower slope and basin with open to very open blowout sand barrens of 50-75% SOIL (sand); 5-20% LITTER; 1-5% **Cyperus schweinitzii** - Carex pensylvanica var. digyna - Calamovilfa longifolia; <1% Stipa curtiseta - Carex obtusata - Koeleria macrantha - Festuca saximontana - Lygodesmia juncea - Oryzopsis hymenoides

map/date site: Cs22 - Cypesch-020717a-i

location: Wainwright Dunes Ecological Reserve; 3.4 km NNE of David Lake peninsula's southern tip; NW9-14-42-5W4; see figure and map Cs22 lat./long.: (centre) 52°35.828'N / 110°36.451'W (NW end 52°35.842'N /

110°36.496'W; SE end 52°35.824'N / 110°36.433'W) (0.025') (GPS)
UTM27: (NW end) 12N 0526466E 5827557N; (SE end) 12N 0526532E 5827337N (30m) (GPS)

collection: 020617a2 (1 replicate @ ALTA / root / rhizome / bulb / leaf: full, 18-24 cm / inflorescence: young, 18 cm / flower: young / old 2000 and 2001 inflorescences and fruit)

photos: I5 I6 I7 I8 I9 (general habitat: panoramic series (right to left), sand dune semiactive blowout basin and slope, pink flags mark plant limits) I10 (habitat detail: sand dune semiactive blowout basin and lower slope, stressed growth, scale to ruler) I11 (habitat detail: sand dune semiactive blowout upper slope, unstressed growth, scale to ruler)

plant numbers: 640 plants counted in 18 m X 55 m area; 30% with inflorescences at mid- to late flowering and early to mid-fruiting

note: none

habitat: sand dune ridge active blowout slope (10° - 23° toward 190° to 220° - SSW to SW) with open xeric sand barrens of 50-75% SOIL (sand) - LITTER; 5-20% Carex pensylvanica var. digyna - Calamovilfa longifolia - **Cyperus schweinitzii**; 1-5% Koeleria macrantha; <1% Stipa curtiseta - Poa sandbergii - Artemisia frigida - Erysimum asperum - Chenopodium pratericola - Helianthus couplandii - Lithospermum incisum - Juniperus horizontalis

map/date site: Cs23 - Cypesch-020717a-ii

location: Wainwright Dunes Ecological Reserve; 3.4 km NNE of David Lake peninsula's southern tip; NW9-14-42-5W4; see figure and map Cs23 lat./long.: (centre) 52°35.832'N / 110°36.491'W (0.025') (GPS))

collection: none

photos: I12 I13 I14 (general habitat: panorama set (right to left), sand dune blowout basin, pink flags indicate plant boundaries)

plant numbers: 230 plants counted in 6 m X 70 m area; generally sparse; only 30% or less in inflorescence

note: plants in basins tend to be smaller, withered, fewer in flower, or poorly developed

habitat: semicrescentic sand dune ridge semiactive blowout slope basin and lower slope (0° to 20° toward 240 - WSW) with very open xeric sand barrens of 50-75% SOIL (sand) ; 5-20% LITTER - Carex pensylvanica var. digyna; 1-5% Calamovilfa longifolia - **Cyperus schweinitzii** - Koeleria macrantha; <1% Festuca saximontana - Carex obtusata

map/date site: Cs24 - Cypesch-020719g

location: Wainwright Dunes Ecological Reserve; 1.8 km WNW of David Lake

peninsula's southern tip; NE11-3-42-5W4; see figure and map Cs24
lat./long.: (centre) 52°35.363'N / 110°38.548'W (0.025') (GPS)

collection: 020719g1 (1 replicate @ PP-4869 / root / bulb / leaf: mature, 12-15 cm / inflorescence: mature, 25 cm / flower: young to mature / old 2000 and 2001 inflorescences and fruit)

photos: (see also photos for Shinneroseris rostrata); K11 (detail habitat: sand dune active blowout, scale to ruler) K12 (detail habitat: sand dune semiactive blowout, scale to ruler)

plant numbers: 580 plants counted in 28 m X 32 m area; 80 plants have mature inflorescences; most plants are fruiting this year and are well developed; plants growing best in open sand

note: associated with Shinneroseris rostrata (020719g); marked by pink tape on low choke cherry 8 m @ 80° toward site; in less open sand Carex pensylvanica is the major ground cover with mostly unfruiting or very young inflorescence bearing plants; aspen / choke cherry grove to NW up the slope, and young successional aspen at the base of the slope

habitat: sand dune ridge slope (12° to 22° toward 220° - SW) of semiactive to semistable old blowout with subxeric sand grassland of 50-75% SOIL (sand) - LITTER; 5-20% **Cyperus schweinitzii** - Carex pensylvanica var. digyna; <1% Calamovilfa longifolia - Lygodesmia juncea - Shinneroseris rostrata

map/date site: Cs25 - Cypesch-020719h

location: Wainwright Dunes Ecological Reserve; 1.8 km WNW of David Lake peninsula's southern tip; NE11-3-42-5W4; see figure and map Cs25
lat./long.: (centre) 52°35.375'N / 110°38.534'W (0.025') (GPS)

collection: none

photo: none

plant numbers: 35 plants counted in 3 m X 7 m area; 4 plants in midinflorescence; includes two previous year's culms

note: associated with Shinneroseris rostrata (020719h); see Cyperus schweinitzii 020719g

habitat: sand dune ridge slope of semiactive to semistable old blowout with subxeric sand grassland of 50-75% SOIL (sand) - LITTER; 5-20% **Cyperus schweinitzii** - Carex pensylvanica var. digyna; <1% Calamovilfa longifolia - Lygodesmia juncea - Shinneroseris rostrata

map/date site: Cs26 - Cypesch-020719i

location: Wainwright Dunes Ecological Reserve; 1.8 km WNW of David Lake peninsula's southern tip; NE11-3-42-5W4; see figure and map Cs26
lat./long.: (centre) 52°35'339'N / 110°38.519'W (0.025') (GPS)

collection: 020719i1 (1 replicate @ ALTA / root / bulb / leaf: mature, 14-16 cm / culm: mature, 15-32 cm / inflorescence: nature to submature, 20-28 cm / flower: 20% mature / fruit: 80% submature)

photo: none

plant numbers: 93 plants counted in 2.5 X 8 m area; leaves very small and narrow, withered; no current year's inflorescences recorded; population possibly failing at this location; also present are over 50 inflorescences from 2001

note: associated with Shinneroseris rostrata (see 020719i)

habitat: sand dune ridge semiactive old blowout slope midsection (12° to 18° toward 265° - W) with open to semiopen xeric to subxeric sand barrens of 50-75% SOIL (sand) - LITTER; 5-20% Calamovilfa longifolia - **Cyperus schweinitzii**; 1-5% Cladonina mitis - Carex pensylvanica var. digyna; <1% Cetraria ericetorum - Festuca saximontana - Heterotheca villosa - Shinneroseris rostrata

Photos: Photographs of habitats and plant locations for *Cyperus schweinitzii* in the Wainwright Dunes Ecological Reserve (see compilation volume)

- Cs12—Cypesch-020616c
  - B18 (general habitat: sand dune blowout slope, looking NW)
  - B20 (general habitat: sand dune blowout slope, looking SE, scale to backpack, blue flags mark plants)
  - B21 (general habitat: sand dune blowout slope base, dark tone at base is previous years' dead inflorescences, blue flags mark individual plants)
  - B22 (habitat detail: young foliage and previous years' dead inflorescences at sand dune blowout slope base, scale to pen)
  - C18 (habitat detail: base of sand dune blowout slope, note green foliage concentration)
  - C19 (habitat detail: sand dune blowout slope, population extends from base of dune ridge blowout to about half to 2/3 up toward crest)

- Cs13—Cypesch-020616d
  - B23 (plant population: in sand dune blowout, note grey strip at base of slope is the Cyperus schweinitzii's dead culm accumulations from previous years, scale to backpack)
  - Cs14—Cypesch-020616e
  - B24 (general habitat: sand dune blowout slope, population along mid- to lower slope)
  - B25 (general habitat: sand dune blowout slope, SE end, blue flags mark population along mid- to lower slope)

  - C20 (plant detail: plant in situ, note previous year's culm and inflorescence, scale to pen)
  - C21 (plant detail: plant in situ, note previous year's culm and inflorescence, scale to pen)

- Cs15—Cypesch-020714f
  - F18 (general habitat: sand dune blowout slope base, pink flags mark plant boundary) F19 (general habitat: sand dune blowout slope base, pink flags mark plant boundary)
  - E23 (detail of plants detail: plant growth habit with young inflorescences)
  - E24 (detail of plants detail: plant growth habit with young inflorescences)
  - E25 (detail of plants detail: plant growth habit with young inflorescences)
  - Cs16—Cypesch-020715c
  - F23 (habitat : sand dune blowout slope, NW end of the blowout, pink flags mark plant boundary)
  - F24 (general habitat: semistable sand dune blowout, pink flags mark plants on SE end of blowout)
  - F25 (habitat detail; semistable sand dune blowout, scale to ruler)
  - G1 (habitat detail; semistable sand dune blowout, scale to ruler)
  - H0 (plant detail: mature inflorescence, mid-flowering to young fruit development)
  - H4 (plant detail: mature inflorescence, mid-flowering to young fruit development)
  - H1 (plant detail: growth habit)
  - H2 (plant detail: growth habit)
  - H3 (plant detail: growth habit)

- Cs17—Cypesch-020716b
  - G2 (general habitat: sand dune semistable blowout slope, pink flags mark plant boundary)

- Cs18—Cypesch-020716c
  - G3 (general habitat: sand dune semiactive blowout basin slope, pink flags mark plant boundary)
  - G4 (general habitat: sand dune semiactive blowout basin slope, pink flags mark plant boundary)
  - H10 (plant detail: growth habit with mature inflorescences at mid-flowering to young fruit)
  - H11 (plant detail: growth habit with mature inflorescences at mid-flowering to young fruit)
  - H12 (plant detail: growth habit with mature inflorescences at mid-flowering to young fruit)
  - H13 (plant detail: growth habit with mature inflorescences at mid-flowering to

young fruit)

- Cs19—Cypesch-020716d
  - G5 (general habitat: panorama series (right to left) of sand dune blowout basin, flags marking plant boundaries)
  - G6 (general habitat: panorama series (right to left) of sand dune blowout basin, flags marking plant boundaries)
  - G7 (general habitat: panorama series (right to left) of sand dune blowout basin, flags marking plant boundaries)
  - G8 (general habitat: panorama series (right to left) of sand dune blowout basin, flags marking plant boundaries)
  - G9 (habitat detail: sand dune blowout slope, scale to ruler)
  - G10 (habitat detail: sand dune blowout base, pink flags mark plant boundaries
  - G11 (habitat detail: sand dune blowout base, pink flags mark plant boundaries)
  - G12 (habitat detail: sand dune blowout base, pink flags mark plant boundaries)

- Cs10—Cypescn-020716f
  - G12 (general habitat: panorama series (1/4 right to left), sand dune blowout basin and slope, pink flags mark upper and lower plant boundaries)
  - G13 (general habitat: panorama series (2/4 right to left), sand dune blowout basin and slope, pink flags mark upper and lower plant boundaries)
  - G14 (general habitat: panorama series (3/4 right to left), sand dune blowout basin and slope, pink flags mark upper and lower plant boundaries)
  - G15 (general habitat: panorama series (4/4 right to left), sand dune blowout basin and slope, pink flags mark upper and lower plant boundaries)
  - G16 (general habitat: panorama series (right to left), sand dune blowout basin and slope, pink flags mark upper and lower plant boundaries)
  - G17 (habitat detail: sand dune blowout basin)

- Cs22—Cypesch-020717a-I
  - I5 (general habitat: panoramic series (right to left), sand dune semiactive blowout basin and slope, pink flags mark plant limits)
  - I6 (general habitat: panoramic series (right to left), sand dune semiactive blowout basin and slope, pink flags mark plant limits)
  - I7 (general habitat: panoramic series (right to left), sand dune semiactive blowout basin and slope, pink flags mark plant limits)
  - I8 (general habitat: panoramic series (right to left), sand dune semiactive blowout basin and slope, pink flags mark plant limits)
  - I9 (general habitat: panoramic series (right to left), sand dune semiactive blowout basin and slope, pink flags mark plant limits)
  - I10 (habitat detail: sand dune semiactive blowout basin and lower slope, stressed

growth, scale to ruler)

  - I11 (habitat detail: sand dune semiactive blowout upper slope, unstressed growth, scale to ruler)
  - Cs23—Cypesch-020717a-ii
  - I12 (general habitat: panorama set (1/3 right to left), sand dune blowout basin, pink flags indicate plant boundaries)
  - I13 (general habitat: panorama set (2/3 right to left), sand dune blowout basin, pink flags indicate plant boundaries)
  - I14 (general habitat: panorama set (3/3 right to left), sand dune blowout basin, pink flags indicate population boundaries)

- Cs24—Cypesch-020719g
  - K11 (detail habitat: sand dune active blowout, scale to ruler)
  - K12 (detail habitat: sand dune semiactive blowout, scale to ruler)

Eleocharis elliptica Kunth—**slender spike-rush**—***CYPERACEAE***

This is a slender graminoid of non-acidic wetlands that has a provincial Rank of **SU** in Alberta, and a global Rank of **G5T5** (Vujnovic & Gould 2002, ANHIC 2002). It may be distinguished from other spike-rush species by its notably fasciated, or flattened, culm that has a loose reddish purple sheath at its base, and has an achene that is somewhat triangular, distinctly yellowish, with a minute ridge around its crest surrounding its beak. This species recently has undergone some taxonomic revision, with former treatments including *Eleocharis tenuis* var. *borealis* and *Eleocharis compressa* var. *borealis* (Kershaw *et al.* 2001). Fehr (1984) reported "*Eleocharis compressa* var. *borealis*" from a shrubby fen in his community stand 021, in the vicinity of Ribstone Creek area to the west of the ecological reserve boundary. During the survey in 2002, the author also collected a plant with fasciated culms and entire brownish culm-bases, also tentatively identified as *Eleocharis compressa* (Macdonald 020719d6). This species is included in this discussion pending confirmation of the specimens from the study area. At the time of writing, Gould (2003) related that the Reserve's collected plant material is possibly *Eleocharis elliptica*. However, there is another rare species, *Eleocharis mamillata* that should be considered. They differ in that the former has proximal bract scales that completely envelop the culm top, while the latter's scles only partially envelop the culms.

This species extends across central and northern North America, occurring in 9 provinces and 24 states, and is rare in Alberta and Saskatchewan, and in one state (NatureServe 2003). It has been mapped in *Rare Vascular Plants of Alberta* (Kershaw *et al.* 2001) from one location in the southern portion of the Boreal Forest Natural Region to the west of Edmonton but from only one location in the northwestern portion of the Parkland Natural Region, with none from its eastern portion (ANHIC 2003, Kershaw *et al.* 2001). Fehr's 1984 report recorded it from the vicinity of Ribstone Creek, west of the Wainwright Dunes Ecological Reserve's boundaries, but Macdonald collected it from the beaver dam on the large beaver pond southeast of the Great Fen.

The number of individual plants for this species occurring in the Reserve could not be accurately determined. Fehr gave no number of plants, except that it evidently was "rare", presenting a 0.5% cover in his sample plots. Macdonald's incidental collection from within the Reserve was of two plants from a concentration of at least 6 plants that presented less than a 1% cover in its habitat.

The habitat within the Ecological Reserve was a shrubby mixed marsh meadow fringe along a subhygric beaver dam with an extremely open low shrub cover of *Cornus stolonifera*, and a semiclosed mixed marsh cove of *Scirpus microcarpus* var. *rubrotinctus, Carex urticularia, Lycopus americanus, Lycopus asper, Glyceria striata* and others. The habitat to the west of the Reserve was recorded by Fehr (1984) as being a subhydric shrubby graminoid fen along the creek in a flat stream valley basin with a semiopen thicket of *Betula pumila, Salix canescens* and *Cornus stolonifera* , and a semiclosed herb cover of *Carex aquatilis, Carex utriculata, Eriophorum polystachion, Galium boreale, Carex livida, Menyanthes trifolia* and others.

Any habitat threats to the potential number of plants within the Reserve and its vicinity would be related to the drawdown effects of the prolonged drought situation on the beaver ponds and dams, which might change the habitat conditions enough to be unfavourable for the species to survive or to allow other plants to out-compete it. Since the dam crest site also was shared with wildlife and possibly cattle as a trail for crossing the waterway, their trampling or incidental grazing may have an impact.

Management concerns for this species first should be to find and confirm the determination of the collections of Macdonald and, if any exist, of Fehr. The populations also should be refound and monitored to determine the impact of the drought and incidental wildlife and cattle movement and browsing.

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Eleocharis elliptica* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	frost (4)
Flood Hazard	not apply
Soil Drainage	imperfectly drained (5), poodly drained (6)
Perviousness	moderately (2)
Site: Macro	not apply
Site: Meso	depression (6), level (7)
Site: Micro	irregular (5), straight (1)
Site: Surface Shape	straight (1), concave (2)
Ecological Moisture Regime	hygric (7), subhygric (5), subhydric (8)
Nutrients	?mesotrophic (3)
Successional Status: 1	young seral (2)
Successional Status: 2	not apply
Disturbance Factors	water (8)

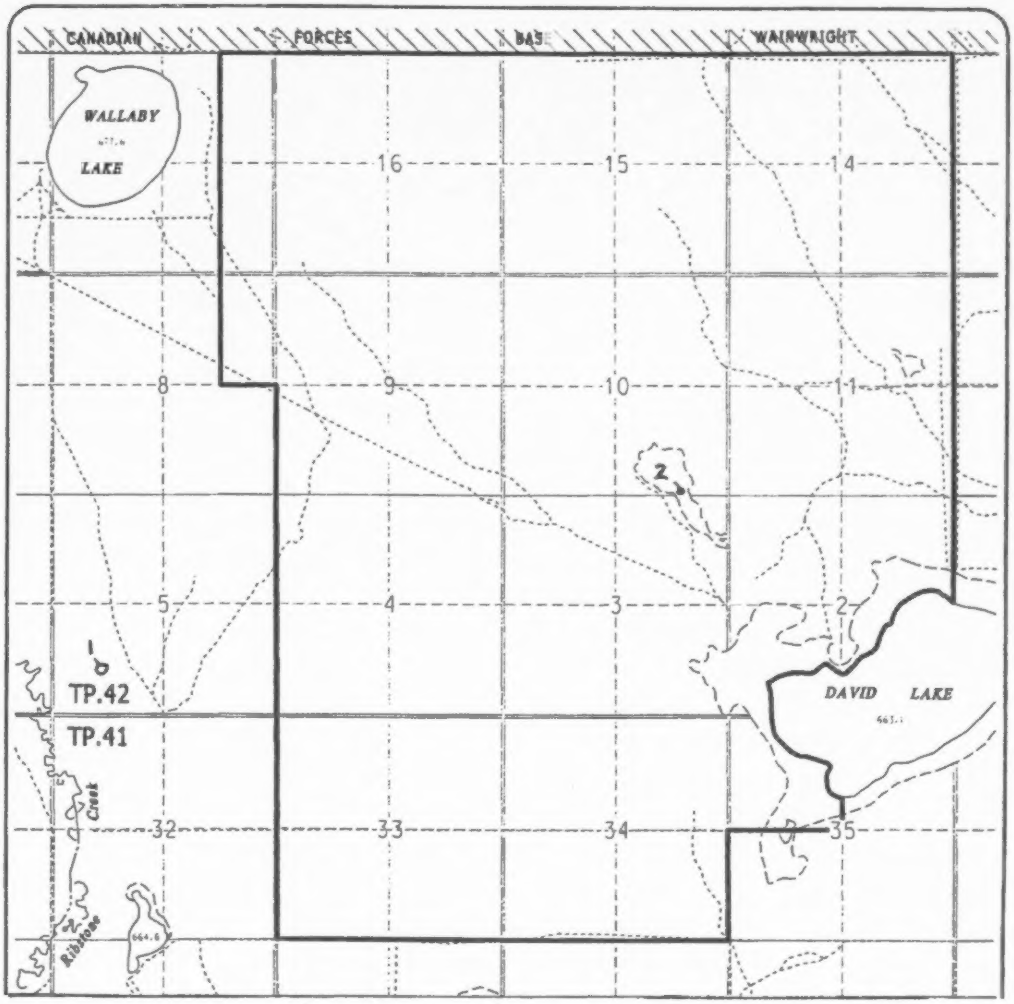
ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	mid- to late June to early July
Phenology: reproductive – inflorescence	no information (?May)
Phenology: reproductive – flower	no information (?June)
Phenology: reproductive – fruit	no information (?August)
Habitat Threats	drought drawdown of stream
Management Considerations	monitoring populations

Plant location summary for *Eleocharis elliptica* in the Wainwright Dunes Ecological Reserve

map site / date site	location coordinates	plant numbers	habitat
Ee1 – Eleoell-84xxxxa	vicinity of Ribstone Creek	no information	shrubby fen
Ee2 – Eleoell-020719d	52 35.639'N 110 38.038	1 (6?) (1 m X 1 m)	drawdown beaver pond dam

Map: Species locations for *Eleocharis elliptica* in the Wainwright Dunes Ecological Reserve (o indicates approximate reported location)


CANADIAN FORCES BASE WAINWRIGHT
WALLABY LAKE
16
15
14
8
9
10
11
2
5
4
3
2
1
TP.42
TP.41
DAVID LAKE
32
33
34
35
Ribstone Creek

PREVIOUSLY REPORTED SPECIES LOCATIONS

map/date site: Ee1 – Eleoell-84xxxxa
location: out of Wainwright Dunes Ecological Reserve; east of Ribstone Creek, ca 6 km WSW of peninsula southern tip; 4-2-41-5W4; see map Ee1 UTM27 520520 5825610 (□50 m) (map)
reference: Fehr, A. 1984. Wainwright Study Area: Biophysical Inventory, Technical Report No. t/65, Edmonton AB.
collection: no information
photo: no information
plant numbers: no information (rare)
note: none
habitat: flat stream valley basin subhygric organic soil with shrubby graminoid fen along creek of LOW SHRUB (30% – semiopen) Betula pumila (25%) – Salix canescens (15%) – Cornus stolonifera (1%); HERB (85% – semiclosed) SOIL (organic) (70%) – WATER (25%) – Carex aquatilis (15%) – Carex utriculata (10%) – Eriophorum polystachion (10%) – Galium boreale (10%) – SOIL (mineral) – LITTER (5%) – Carex livida (5%) – Carex virgata (5%) – Eleocharis acicularis (5%) – Equisetum variegatum (5%) – Menyanthes trifolia (5%) – Pedicularis groenlandica (5%) – Triglochin maritima (5%) – Tofieldia glutinosa (5%) – Viola nephrophylla (5%) – Antennaria pulcherrima (3%) – Rubus pubescens (3%) – Solidago spathulata (2%) – Zizia aptera (2%) – Solidago canadensis (originally Solidago lepida) (1%) – Aster laevis (1%) – Prunella vulgaris (1%) – Ranunculus cymbalaria (1%) – Salix pedicellaris (1%) – Senecio pauperculus (1%) – Zygadenus elegans (1%) – **Eleocharis ?elliptica** (originally Eleocharis compressa) (0.5%) – Pinguicula vulgaris (0.5%) – Sparganium minimum (0.5%) – Utricularia intermedia (0.5%) – Drosera ?linearis (originally Drosera anglica) (0.2%) – Carex limosa (0.1%) – Lilium philadelphicum (0.1%) – Lobelia kalmii (0.1%) – Parnassia palustris (0.1%) – Sisyrinchium montanum (0.1%) – Typha latifolia (0.1%); elev: 670 m
comment: this UTM is at Ribstone Creek, about 4 km to the west of the Ecological Reserve's western boundary; Fehr's vegetation sample of Stand 021-fen (SW and W of Wainwright Dunes Ecological Reserve); ANHIC data base did not include this record

RECENTLY DISCOVERED SPECIES LOCATIONS

map/date site: Ee2 – Eleoell-020719d
location: Wainwright Dunes Ecological Reserve; drawdown beaver pond at SE end of the Great Fen, this site includes the basin shore at the western end of the fronting beaver dam; NE16-3-42-5W4; also see figure and map La15

lat./long.: (centre) 52°35.639'N / 110°38.038'W (□0.025') (GPS)

collection: 020719d6 (1 replicate @ PP-4891 / root / rhizome / culm / aborted inflorescences)

photos: see Lycopus americanus photos; J1 (detail of plant growth habit) K2 (general habitat: old beaver dam seen from old lodge, pink flags mark plant locations of Lycopus americanus) K4 (general habitat: old beaver dam looking SSW, pink flags mark plant locations of Lycopus americanus)

plant numbers: >1 (6?) plant counted in a 1 m X 30 m area; none flowering

note: associated with Lycopus americanus 020719d

habitat: drawdown beaver pond dam with subhygric sandy organic marsh shrubby mixed marsh meadow fringe of LOW SHRUB (extremely open to open) <1% Cornus stolonifera - Ribes hirtellum - Rosa acicularis - Salix petiolaris - Populus tremuloides (sapling); HERB (semiclosed to closed) 20-50% Scirpus microcarpus var. rubrotinctus; 5-20% SOIL (sandy organics) - LITTER - Carex urticulata; 1-5% Lycopus americanus - Lycopus asper - Glyceria striata - Chenopodium rubrum - Mentha arvensis - Carex diandra; <1% Eleocharis palustris var. palustris - Equisetum arvense - Poa palustris - Stellaria calycantha - Calamagrostis inexpansa - Polygonum arenastrum - Urtica dioica var. gracilis - Carex □ Ovales - Geum macrophyllum var. perincisum - Sonchus uliginosus - Poa ?interior - Rosa acicularis - Anemone canadensis - Aster ciliolatus - Glyceria borealis - Agrostis scabra - Lysimachia thyrsiflora - Erigeron philadelphicum - Galium trifolium - Calamagrostis canadensis - Cirsium arvense - Polygonum lapathifolium - Carex lanuginosa - Rorippa palustris var. ?hispida - Potentilla norvegica - Solidago canadensis var. canadensis - Plantago major - Sonchus asper - **Eleocharis ?elliptica** (originally E. compressa)

Chenopodium leptophyllum (Nutt. *ex* Moq.) Nutt. *ex* S. Wats.—narrow-leaved goosefoot—*CHENOPODIACEAE*

This annual herb of sandy, open and wooded habitats has an provincial Rank of **SU** in Alberta, and a global Rank of **G5** (Vujnovic & Gould 2002, ANHIC 2002). It is an erect plant with narrow, lanceolate to linear (rather than broad) leaves that are seasonally farinose (mealy) and tend to be a bluish or light green colour. It has an open panicle of minute green flowers developed in the upper leaf axils and at the terminal growing points of the stem. The determination of this species in the field is considerably problematic since it may be confused with several other common and rare species of *Chenopodium*. Of particular difficulty is the recognition of the defining minute characteristics without a microscope, such as the flower and fruit pericarp. The combination of leaves with a strictly single vein and absolutely no shorter side veins at the underside bases of the larger leaves, a tight pericarp (thin skin) that closely sticks to the horizontally oriented seeds that, at least at maturity, cannot easily be scraped off the seed, and seeds with a black but slightly wrinkled coating (testa), should separate it from the following four species. The common *Chenophyllum pratericola* (goosefoot) also is erect, but has leaves with three veins, that often must be very carefully looked for, particularly at their base, and are mealy at least to mid-season, and has a loose pericarp that can readily be separated from the seed. The rare *Chenophyllum atrovirens* (dark-green goosefoot, S1 G5) has smaller calyx-lobes that do not cover the mature seed, the plant is somewhat ascending rather than erect, and the larger leaves often have basal lobes. The rare *Chenophyllum dessicatum* (dried goosefoot, S1S2 G5) also shares small calyx-lobes, but has a loosely attached pericarp, a seed with a dark, shiny, smooth coating, three-veined leaves, and branches notably from the base. The rare *Chenophyllum subglabrum* (smooth narrow-leaved goosefoot, S1 G3G4) also has a single vein in the leaves, but is quite glabrous except perhaps in the inflorescence, and has a larger seed, about 1.5 cm long, with a loose pericarp. This is the first record of this species from the Ecological Reserve. However, there is some dispute about the determination of the vouching specimens which may appear to have loosely adherent pericarps, and indeed, may well be another provincially rare species, *Chenopodium dessicatum* (K. Vujnovic 2002, Moss 1983, Gleason & Cronquist 1991).

This species occurs in the western and central portions of the continent, in six provinces and 37 states. While its provincial Rank is being confirmed in Alberta, it is known to be rare in Ontario and extirpated from Nova Scotia, and is rare in four states (NatureServe 2003, Kershaw *et al.* 2001). In Alberta, it appears to have scattered locations in the Grassland and Parkland Natural Regions, with at least one station reported from just beyond the northeastern edge and to the south of CFB Wainwright; however, there is no accurate information confirming the number of known locations in the province (ANHIC 2003). This is the first report of the species from the Wainwright Dunes Ecological Reserve, with a cluster of seven locations in its southwestern portion, about 3.5 km west of David Lake; the species was not reported in any of the previous biophysical surveys (fehr 1984, Cottonwood Consultants, Ltd. 1986, Anon 1998). This concentration may be an under representation related to the late seasonal development of the plants and their discovery only late into the 2002 survey period. Hence, the species may well have been overlooked prior to development of the inflorescence, or mistaken for the widespread *Chenopodium pratericola*. Fehr's 1984 report on the area did not include the species, nor any of the subsequent lists.

A total of 164 individual plants were counted in the seven locations in 2002, all occurring within the Reserve boundaries, possibly with several others to the southwest, which, however, were not properly investigated. The population numbers varied from a single to over one hundred plants in sampled areas of less than 0.1 m X 0.1 m, to 3 m X 45 m.

The main habitat of this species was the sand dune blowout erosion slopes that it shared with the other rare species, *Shinneroseris rostrata* and *Cyperus schweinitzii*. This habitat generally was the middle to upper blowout slopes that face southwest to southeast on xeric, semiactive to active, bare sand in association with an open community of *Stipa curtiseta, Calamovilfa longifolia, Carex pensylvancia* var. *digyna, Carex siccata, Helianthus couplandii, Lygodesmia juncea, Carex obtusata, Heterotheca villosa* and others, including the common *Chenopodium pratericola*. In one instance it was situated on the relatively level ground of a subxeric sand plain in an open shrubby grassland of *Amelanchier alnifolia, Prunus virginiana, Stipa curtiseta, Agropyron trachycaulum, Festuca campestris, Koeleria macrantha, Selaginella densa* and others. It possibly has other upland habitats in the Reserve, but they may have been overlooked in the earlier seasonal phases of the 2002 survey.

The habitat threats to this species would include erosion and deposition of sand from the blowouts, and the long-term effects of the prolonged drought in the region. Grazing from cattle was virtually non-existent in the southwestern portion of the reserve, but may be more of a factor elsewhere.

For this species, the first management concerns would be the confirmation of the vouching collections from the 2002 project. K. Vujnovic (2003) of ANHIC indicated that the specimens would be submitted for an authoritative review, possibly by Prof. H.D. Wilson of Texas A&M University, the contributor for the genus to Kartesz' (1994) synonymy texts. If this is determined to be a rare species, either *Chenopodium leptophyllum* or *Chenopodium dessicatum*, then further surveys should monitor the reported populations and search for further populations in the sandland and dune ridge habitats elsewhere in the reserve.

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Chenopodium leptophyllum* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION	
Exposure Type	wind (2), insulation (3)
Flood Hazard	not apply
Soil Drainage	well-drained (3), rapidly drained (2), moderately well drained (4)
Perviousness	rapidly (1), moderately (2)
Site: Macro	not apply
Site: Meso	mid-slope (3), lower slope (4), level (7)
Site: Micro	straight (1)
Site: Surface Shape	concave (2), straight (1)
Ecological Moisture Regime	subxeric (3), submesic (4)
Nutrients	?submesotrophic (2)
Successional Status: 1	young seral (2)
Successional Status: 2	not apply
Disturbance Factors	fire (4)

ANHIC RARE NATIVE PLANT REPORT	
Phenology: vegetative	mid- to late July
Phenology: reproductive – inflorescence	early August
Phenology: reproductive – flower	early to mid-August
Phenology: reproductive – fruit	mid-August to early September
Habitat Threats	wind erosion, grazing
Management Considerations	monitoring populations and drought impacts

Species location summary for *Chenopodium leptophyllum* in the Wainwright Dunes Ecological Reserve

map site / date site	location coordinates	number (size)	habitat
Cl1 – Chenlep-020816b	52°34.683'N 110°39.955'W	4 (1m X 1.5m)	semiactive sand dune blowout
Cl2 – Chenlep-020816c	52°34.640'N 110°39.842'W	2 (0.5m X 0.5m)	active sand dune blowout
Cl3 – Chenlep-020816d	52°34.780'N 110°40.038'W	3 (0.5m X 1m)	active sand dune blowout
Cl4 – Chenlep-	52°34.900'N 110°39.972'W	10	active sand dune

map site / date site	location coordinates	number (size)	habitat
020816e		(2m X 3m)	blowout
CI5 - Chenlep-020816f	52°34.871'N / 110°39.659'W	32 (3m X 45m)	semistable sand dune blowout
CI6 - Chenlep-020816g	52°34.890'N / 110°40.472'W	1 (0.1m X 0.1m)	sandland shrubby meadow
CI7 - Chenlep-020816k	52°34.790'N / 110°40.100'W	112 (4m X 32m)	semistable sand dune blowout

Map: Species locations for *Chenopodium leptophyllum* in the Wainwright Dunes Ecological Reserve (o indicates approximate reported location)

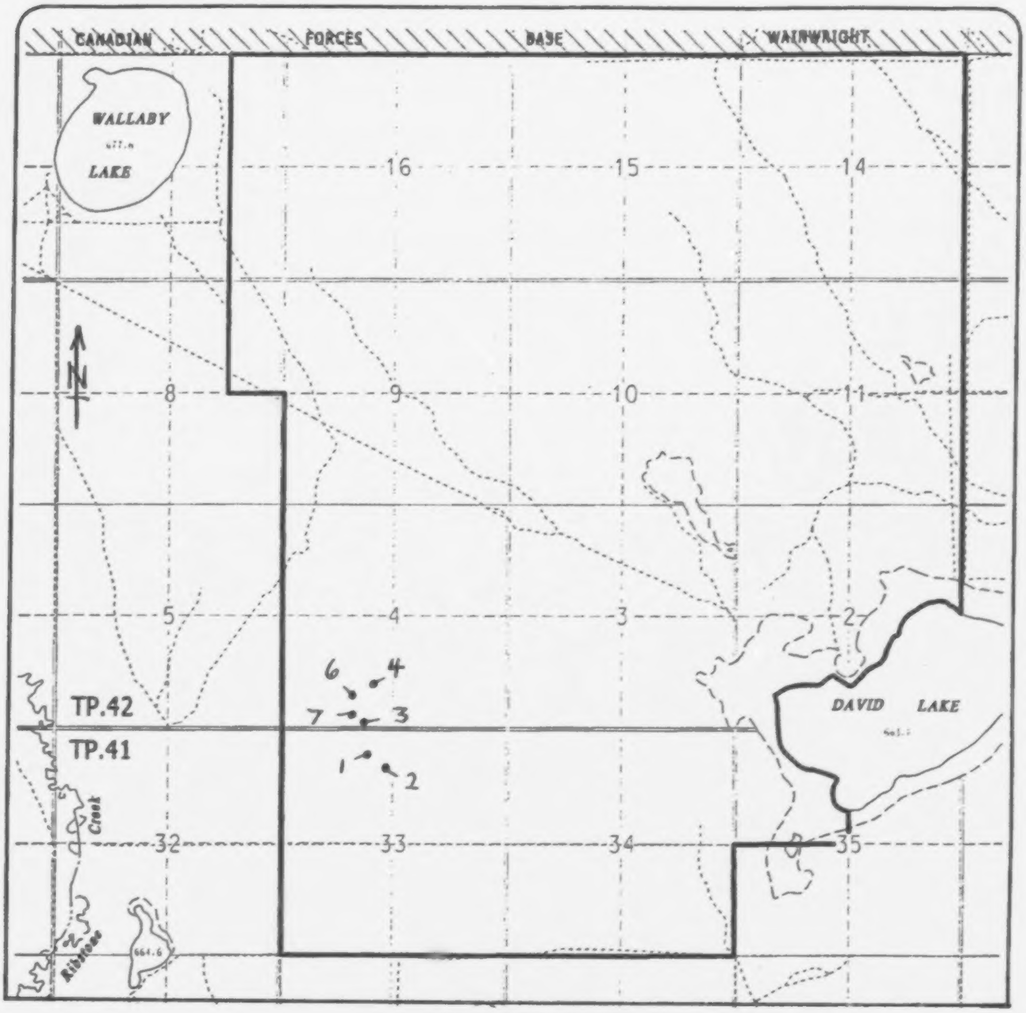
CANADIAN FORCES BASE WAINWRIGHT
WALLABY LAKE
16
15
14
8
9
10
11
5
4
3
2
6
4
7
3
1
2
TP.42
TP.41
DAVID LAKE
32
33
34
35
Creek
Ribstone

Photo: *Chenopodium leptophyllum* (narrow-leaved goosefoot) plant detail: growth habit and inflorescence (CI1 – Chenlep-020816b – O6, photo Ian D. Macdonald)

PREVIOUSLY REPORTED SPECIES LOCATIONS

(none)

RECENTLY DISCOVERED SPECIES LOCATIONS

map/date site: Cl1 - Chenlep-020816b
location: Wainwright Dunes Ecological Reserve; 3.5 km WSW of David Lake peninsula's southern tip; SE14-33-41-5W4; see figure and map Cl1
lat./long.: (centre) 52°34.683'N / 110°39.955'W (0.025') (GPS)
UTM27: (centre) 12N 0522640E 5825169N (30m) (GPS)
collection: none
photos: N10 (habitat detail: sand dune semiactive blowout upper slope, scale to pen) O4 O5 O6 O7 (plant detail: growth habit and inflorescence)
plant numbers: 4 plants counted in 1 m X 1.5 m area; all with inflorescences in young to mid-flowering to early fruiting condition
note: associated with Shinneroseris rostrata; some sand deposition from blowing sand
habitat: sand dune ridge semiactive blowout upper slope (30° toward 215° - SSW) subxeric sand with open sand barrens of 75-95% SOIL (sand); 5-20% LITTER - Calamovilfa longifolia; 1-5% Stipa curtiseta; <1% Chenopodium pratericola - **Chenopodium ?leptophyllum** - Helianthus couplandii - Shinneroseris rostrata

map/date site: site Cl2 - Chenlep-020816c
location: Wainwright Dunes Ecological Reserve; 3.5 km WSW of David Lake peninsula's southern tip; SE14-33-41-5W4; see figure and map Cl2
lat./long.: (centre) 52°34.640'N / 110°39.842'W (0.025') (GPS)
UTM27: (centre) 12N 0522770E 5825091N (30m) (GPS)
collection: none
photo: none
plant numbers: 2 plants counted in 0.5 m X 0.5 m area; all with inflorescences in early to midflowering to early fruiting condition
note: located about 150 m SE of 020816b; marked by pink tape on aspen at slope crest
habitat: sand dune ridge blowout upper slope (SW) subxeric sand with open sand barrens of 50-75% SOIL (sand); 5-20% LITTER - Calamovilfa longifolia - Prunus virginiana; 1-5% Rosa acicularis - Carex pensylvanica - LICHEN; <1% Lygodesmia juncea - Heterotheca villosa - **Chenopodium ?leptophyllum** -

map/date site: site CI3 - Chenlep-020816d

location: Wainwright Dunes Ecological Reserve; 3.5 km WSW of David Lake peninsula's southern tip; SW3-4-42-5W4; see figure and map CI3
lat./long.: (centre) 52°34.780'N / 110°40.038'W (0.025') (GPS)

collection: none

photos: see photos of Shinneroseris rostrata (020816i); N13 (general habitat; pink flags on left mark plants, those on right are Shinneroseris rostrata)

plant numbers: 3 plants counted in 0.5 m X 1.0 m area; all with inflorescences at early to mid-flowering to early fruiting condition

note: associated with Shinneroseris rostrata (020816i); marked by pink tape on low chokecherry at blowout crest

habitat: sand dune ridge blowout SE-facing slope crest subxeric sand with open sand barrens of 20-50% SOIL (sand); 5-20% Stipa curtiseta - LITTER; 1-5% Juniperus horizontalis; <1% Prunus virginiana (sucker) - Calamovilfa longifolia - Carex siccata - **Chenopodium ?leptophyllum**

map/date site: site CI4 - Chenlep-020816e

location: Wainwright Dunes Ecological Reserve; 3.5 km WSW of David Lake peninsula's southern tip; NW3-4-42-5W4; see map CI4
lat./long.: (centre) 52°34.900'N / 110°39.972'W (0.025') (GPS)
UTM27: (centre) 12N 0522619E 5825569N (30m) (map)

collection: none

photo: none

plant numbers: 10 plants counted in 2 m X 3 m area

note: marked by pink flag on dwarf aspen at slope crest

habitat: sand dune ridge stable blowout uppermost slope (15° toward 200° - SSW) subxeric sand with very open sand barrens of 75-95% SOIL (sand); 20-50% LITTER; 5-20% Calamovilfa longifolia; 1-5% Helianthus couplandii - Stipa curtiseta - **Chenopodium ?leptophyllum**; <1% Artemisia frigida - Lygodesmia juncea - Heterotheca villosa - Prunus virginiana - MOSS - Carex pensylvanica - Elaeagnus commutata - Carex obtusata - Campanula rotundifolia - Solidago missouriensis

map/date site: site CI5 - Chenlep-020816f

location: Wainwright Dunes Ecological Reserve; 3.5 km WSW of David Lake peninsula's southern tip; SW2-4-42-5W4; see figure and map CI5
lat./long.: (centre) 52°34.871'N / 110°39.659'W (0.025') (GPS)
UTM27: (centre) 12N 0522972E 5825518N (30m) (map)

collection: none

photo: see photos of Shinneroseris rostrata; N15 (general site: flags mark plant)

plant numbers: 32 plants counted in 3 m X 45 m area between one third and half way up slope; all in early to mid-flowering to very early fruiting

note: associated with Shinneroseris rostrata (020816f); marked by pink tape on Betula occidentalis on opposite side of blowout basin

habitat: sand dune ridge semistable blowout upper slope (37°– 41° toward 235° – WSW) subxeric sand with open sand barrens of 20–50% Calamovilfa longifolia – Stipa curtiseta – MOSS – SOIL (sand); 5–20% LITTER; 1–5% Selaginella densa – Carex pensylvanica – LICHEN – Koeleria macrantha – Rosa acicularis – Elymus canadensis; <1% **Chenopodium ?leptophyllum** – Carex obtusata – Heterotheca villosa – Festuca saximontana – Lygodesmia juncea – Shinneroseris rostrata

map/date site: site CI6 – Chenlep-020816g

location: Wainwright Dunes Ecological Reserve; 3.5 km WSW of David Lake peninsula's southern tip; NE3-4-42-5W4; see map CI6
lat./long.: (centre) 52°34.890'N / 110°40.472'W (0.025') (GPS)
UTM27: (centre) 12N 0522052E 5825735N (30m) (map)

collection: none

photo: none

plant numbers: 1 plant counted in 0.1 m X 0.1 m area; all with inflorescences in early to mid-flowering condition

note: none

habitat: gently rolling sand plain submesic sand with open shrubby meadow of LOW SHRUB (open) 5-20% Amelanchier alnifolia; 1-5% Prunus virginiana; <1% Populus tremuloides (sapling); HERB (closed) 20-50% Stipa curtiseta; 5–20% LITTER – Agropyron trachycaulum subsp. trachycaulum – Festuca scabrella; 1–5% Koeleria macrantha – Agropyron trachycaulum subsp. subsecunda – Selaginella densa – Comandra umbellata var. pallida; <1% Erysimum asperum – Carex siccata – Thermopsis rhombifolia – Artemisia frigida – Festuca saximontana – Galium boreale – **Chenopodium ?leptophyllum**

map/date site: site CI7 – Chenlep-020816k

location: Wainwright Dunes Ecological Reserve; 3.5 km WSW of David Lake peninsula's southern tip; NE3-4-42-5W4; see figure and map CI7
lat./long.: (centre) 52°34.790'N / 110°40.100'W (52°34.796'N / 110°40.105'W on NW end and 52°34.783'N / 110°40.087'W on SE end) (0.025') (GPS)
UTM27: (centre) 12N 052480E 5825365N (12N 052469E 5825378N on NW end and 12N 052490E 5825355N on SE end) (30m) (map)

collection: 020816d1 (vigorous many-branched plant / 2 replicates @ UAC & ALTA / root / stem: full, 25–50 cm / leaf: full / inflorescence: full / flower:

submature to mature / possibly Chenopodium pratericola)

photos: see also photos of Shinneroseris rostrata (020816j) O11 (plant growth habit: vigorous growth, height 0.5 m) O12 (plant detail: inflorescence)

plant numbers: 112 plants counted in 4 m X 22 m area; all in full inflorescence at early flowering development

note: associated with Shinneroseris rostrata (020816j); marked by pink tape on juniper shrub at slope crest

habitat: sand dune ridge semistable blowout upper slope (40° toward 180° - S) subxeric sand with open sand barrens of 50-75% SOIL (sand); 5-20% LITTER - Calamovilfa longifolia; 1-5% Carex pensylvanica - Stipa curtiseta - Helianthus couplandii; <1% Artemisia frigida - Lygodesmia juncea - Prunus virginiana (suckers) - **Chenopodium?leptophyllum** - MOSS - Elaeagnus commutata (seedling) - Carex obtusata

Photos: Photographs of habitats and plant locations for *Chenopodium leptophyllum* in the Wainwright Dunes Ecological Reserve

- ❖ Cl1—Chenlep-020816b
  - ➢N10 (habitat detail: sand dune semiactive blowout upper slope, scale to pen)
  - ➢O4 (plant detail: growth habit and inflorescence)
  - ➢O5 (plant detail: growth habit and inflorescence)
  - ➢O6 (plant detail: growth habit and inflorescence)
  - ➢O7 (plant detail: growth habit and inflorescence)
  - ➢Cl3—Chenlep-020816d, see Shinneroseris rostrata photos
  - ➢N13 (general habitat; pink flags on left mark plants, those on right are Shinneroseris rostrata)
  - ➢Cl5—Chenlep-020816f, see Shinneroseris rostrata photos
  - ➢N15 (general site, flags mark plants)
  - ➢Cl7—Chenlep-020816k
  - ➢O11 (plant growth habit: vigorous growth, height 0.5 m)
  - ➢O12 (plant detail: inflorescence)

Drosera linearis Goldie**—slender-leaved sundew—*DROSERACEAE***

This very small perennial herb species of marly bogs, alkaline wet sites and shores has a provincial Rank of **S2** in Alberta, and a global Rank of **G4** (Vujnovic & Gould 2002, ANHIC 2002). While small, it is very distinctive and easy to identify with its narrow, linear leaves that have reddish, dewy, glandular hairs along the upper leaf surface. Its small white flowers along a raceme, and capsules that hold black oblong seeds. In Alberta it may be mistaken for the related *Drosera anglica* which more often has obovate-linear, rather than linear, leaves, and has seeds which have distinctly attenuate rather than blunt ends.

This species occurs across Canada and the northern states east of the Rocky Mountains, occurring in eight provinces and five of the northern teir of states. It is considered also to be rare in Saskatchewan, Manitoba and Quebec, and in four of the states (NatureServe 2003). Within Alberta it is reported from 19 known locations in the the Rocky Mountain, Parkland and Boreal Natural Regions in the central portion of the province (ANHIC 2003, , Kershaw *et al.* 2001). It was first reported by Fehr (1984), from near Ribstone Creek, just to the west of the present Ecological Reserve boundaries, and within the boundaries by him, and later by Cottonwood Consulting, Ltd. (1986) from the central and southwestern portions of the Great Fen. The Great Fen site was searched diligently several times during the 2002 survey, on 15 and 16 June, 20 and 21 July, and 19 August 2002; however, no plants were rediscovered in the tall thicket fen sites or from the adjacent backshore of the large beaver pond on its southeastern side.

The number of plants of almost 20 years ago from the Great Fen, as reported by Fehr (1984), was given on his specimen label as being "fairly common - here very sparse", while the survey of Cottonwood Consulting, Ltd. (1986) did not indicate any numbers or extent. The 2002 survey did not find the species at all, even though a reasonably intensive survey of the ample potential habitat of the Great Fen area was conducted.

Fehrs's community sample 055 from within the Ecological Reserve was located in the Great Fen basin, located 1.5 to 3 km northwest of David Lake. He characterized it as being a hummocky depression on rolling sandland with subhygric organic soil that supported a shrubby graminoid fen with a very open low shrub cover of *Betula pumila*, and a semiclosed to semiopen herb layer of mosses, *Betula pumila* suckers, *Salix pedicellaris, Carex diandra, Carex limosa, Menyanthes trifoliata, Equisetum fluviatile, Triglochin maritima, Carex aquatilis, Eriophorum viridi-carinatum, Parnassia palustris* and other fen species. His survey of the occurrence at Ribstone Creek, outside of the Ecological Reserve's boundaries, also described the habitat as being a subhygric organic stream basin supporting a shrubby graminoid fen of semiopen *Betula pumila, Salix canescens* and *Cornus stolonifera*, and semiclosed herb cover in standing water of

Carex aquatilis, Carex utriculata, Eriophorum polystachion and other fen species. The survey in 2002 examined the general UTM27 locations of Fehr's report, those of Cottonwood Consulting, Ltd. (1986), and Cliff Wallis' precise locations for this and his *Drosera anglica* collection (ANHIC 2002), and their immediate and general vicinities. However, no trace of this species was relocated. Nevertheless, the habitat here still appeared to be entirely suitable for this occurrence of this species, in spite of the effects of the drought in which, at least in the early summer when there was only local surface water evident. Neverhteless, by mid-July there was at least 5 to 12 cm depth of standing water in much of the area. A list of the 86 plant species from this habitat included two notable additions to the Reserve flora which represent considerable range extensions in the province, *Minuartia dawsoniensis* and *Silene menziesii*. Additionally, Wallis' (1990) study of saline wetlands and springs in the Grassland and Parkland Natural Regions listed this species as occurring on higher edges and hummocks of wet saline and subsaline meadows along the lake. While this phrasing appears to have referred to the hummocky seepage habitats of David Lake, it is more likely that he referred to the backshores of the large beaver pond at the southeastern end of the Great Fen where, in 2002, the pond level was considerably drawndown and the backshore habitat appeared to be most unsuitable. Further, the active seepage fen 600 m north of David Lake also was examined, but no populations were discovered there either.

The main and immediate habitat threat to this species probably is the long term impact of the drought conditions within the region, particularly where the critical habitat conditions are related to moisture regime, associated community patterns and browsing use of the site by wildlife. Grazing by cattle appeared to have no effect at this time.

The premier management consideration for this species would be to redetermine the species occurrence within the Great Fen basin. No individuals at all were found during the 2002 survey, but there was ample potential habitat in the tall thicket and shrubby graminoid fen habitats occurring within this basin. There should be a clarification of the report by Wallis (1990) for the species' occurrence along the "lake", so as to include or eliminate the David Lake backshore as a habitat within the reserve. An examination and monitoring of the long-term effects of the drought conditions on the fen habitats could be undertaken.

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Drosera linearis* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	frost (4)
Flood Hazard	not apply
Soil Drainage	poorly drained (6), very poorly drained (7)
Perviousness	slowly (3)
Site: Macro	valley floor (6)
Site: Mesolevel (7)	
Site: Micro	straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	subhydric (8), hydric (9)
Nutrients	?submesotrophic (2), ?oligotrophic (1)
Successional Status: 1	young climax (7)
Successional Status: 2	not apply
Disturbance Factors	water related (8)

ANHIC RARE NATIVE PLANT REPORT

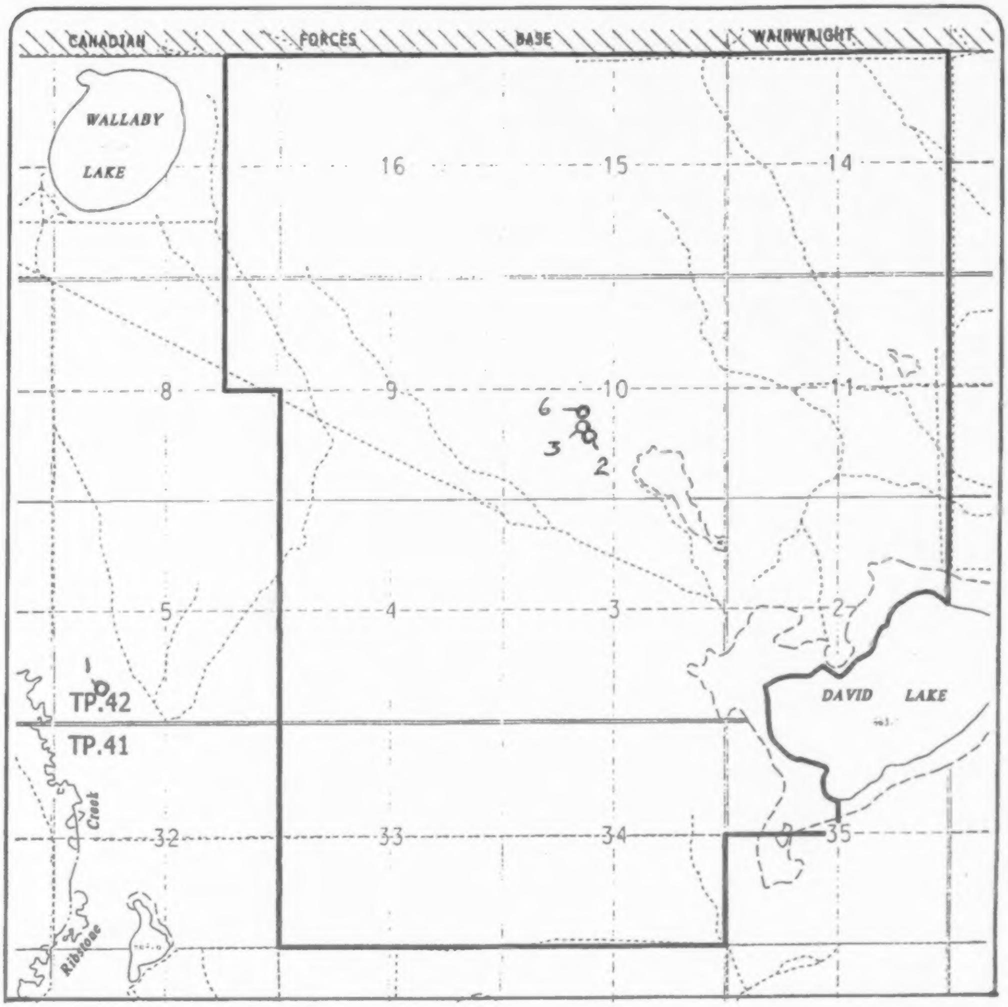
Phenology: vegetative	late June; early July
Phenology: reproductive - inflorescence	no information
Phenology: reproductive - flower	early to mid- July
Phenology: reproductive - fruit	no information
Habitat Threats	drainage due to drought
Management Considerations	monitoring populations

Table 2: Species location summary for *Drosera linearis* in the Wainwright Dunes Ecological Reserve

map site / date site	location coordinates	numbers (size)	habitat
+DI1 - Droslin-830708a	UTM27 520500 5825550	uncommon	patterned fen along creek
DI2 - Droslin-830728a	UTM27 524250 5827550	occasional	hummocky depression meadow
DI3 - Droslin-86xxxxa	52°36.100'N 110°38.400'W	no information	extensive beaverpond & fen complex
DI4 - Droslin-	52°35.900'N 110°38.400'W	no information	patterned fen

map site / date site	location coordinates	numbers (size)	habitat
86xxxxb			
DI5 – Droslin-90xxxxa	UTM27 524300 5827550	no information	pond- and lakeshore and fen meadows
DI6 – Droslin-020720a	52°36.000'N 110°38.500'W	none recorded	thicket and shrubby graminoid fen

Map: Species locations for *Drosera linearis* in the Wainwright Dunes Ecological Reserve (o indicates approximate reported location)


CANADIAN
FORCES
BASE
WAINWRIGHT
WALLABY
LAKE
16
15
14
8
9
10
11
6
3
2
5
4
3
2
1
TP.42
TP.41
DAVID LAKE
Creek
32
33
34
35
Ribstone

PREVIOUSLY REPORTED SPECIES LOCATIONS

map/date site: **DI1 - Droslin-830708a**
location: adjacent to Wainwright Dunes Ecological Reserve // lat./long.: 52° 35'N / 110° 42' W // UTM27 520500E / 5825550N // SW5-42-5W4 // see map DI1
source: ANHIC // Element Occurrence PDDRO02060 # 011
reference: —
observation: A. Fehr 8 July 1983
photo: none
collection: Fehr, A. & S. Charbonneau s.n. // 1983-07-08 // @ PP # 143 // det: K.E.. Tannas // vidi & stet IDM-02 // specimen source code S83FEHPPABCA02
plant numbers: uncommon
note: swamps and bogs
habitat: patterned fen along creek // elev: 670 m
comment: ANHIC data base requires correction; this UTM is about 4 km west of study area at Ribstone Creek; plant in mid-flowering with flower and flower buds; Fehr's vegetation sample of Stand 021-fen (SW and W of Wainwright Dunes Ecological Reserve); 6-2-42-5W4; note that Fehr also listed "Eleocharis compressa" here, which may be the rare Eleocharis elliptica

interpretation of Fehr 1984 vegetation plot data for Study Area 021:
location is out of Wainwright Dunes Ecological Reserve; east of Ribstone Creek, ca 6 km WSW of peninsula's southern tip; UTM27 520520 5825610 ("50 m) (map); 4-2-41-5W4
population (no information)
habitat is flat stream valley basin subhygric organic soil with shrubby graminoid fen of LOW SHRUB (30% - semiopen) Betula pumila (25%) - Salix canescens (15%) - Cornus stolonifera (1%) HERB (85% - semiclosed) SOIL (organic) (70%) - WATER (25%) - Carex aquatilis (15%) - Carex utriculata (10%) - Eriophorum polystachion (10%) - Galium boreale (10%) - SOIL (mineral) - LITTER (5%) - Carex livida (5%) - Carex virgata (5%) - Eleocharis acicularis (5%) - Equisetum variegatum (5%) - Menyanthes trifolia (5%) - Pedicularis groenlandica (5%) - Triglochin maritima (5%) - Tofieldia glutinosa (5%) - Viola nephrophylla (5%) - Antennaria pulcherrima (3%) - Rubus pubescens (3%) - Solidago spathulata (2%) - Zizia aptera (2%) - Solidago canadensis (S. lepida) (1%) - Aster laevis (1%) - Prunella vulgaris (1%) - Ranunculus cymbalaria (1%) - Salix pedicellaris (1%) - Senecio pauperculus (1%) - Zygadenus elegans (1%) - Eleocharis compressa (0.5%) - Pinguicula vulgaris (0.5%) - Sparganium minimum (0.5%) - Utricularia intermedia (0.5%) - **Drosera ?linearis**

(originally listed as Drosera anglica) (0.2%) – Carex limosa (0.1%) – Lilium philadelphicum (0.1%) – Lobelia kalmii (0.1%) – Parnassia palustris (0.1%) – Sisyrinchium montanum (0.1%) – Typha latifolia (0.1%)

map/date site: **DI2 – Droslin-830728a**
location: Wainwright Dunes Ecological Reserve // David Lake area // lat./long.: 52° 36'N / 110° 38' W // UTM27 524850E 5827300N (see below) // SE10-42-5W4 // see map DI2
source: ANHIC // Element Occurrence PDDRO02060 # 010
reference: Fehr, A. 1984. Wainwright Study Area: Biophysical Inventory. Natural Areas Program, Public Lands Division, Alberta Energy and Natural Resources, Technical Report No. t/65, Edmonton.
observation: Fehr 1985
collection: Fehr, A. & S. Charbonneau s.n. // 1983-07-28 // @ PP # 680 // det: K.E. Tannas // vidi & stet IDM-02
photo: none
plant numbers: "occasional"
note: "swamps and bogs"
habitat: hummocky depression // elev: 678 m // Fehr's vegetation sample of Stand 55
comment: collected specimen was originally determined as Drosera angelica by K.E. Tannas, but redetermined to Drosera linearis by J. Gould (no date); specimen also confirmed by I.D. Macdonald 2002; vegetative with 6 leaves and small; 6-10-42W

(interpretation of Fehr 1984 vegetation plot data for Study Area ID 045)
location is within Wainwright Dunes Ecological Reserve; ca 2.3 km NW of peninsula's southern tip; Fehr's mapped location would be UTM27 524250 5827550 (~50 m) (map); SE6-10-42-5W4
population (fairly common – here very sparse)
habitat is hummocky depression on rolling sandland with subhygric organic soil with shrubby graminoid fen of LOW SHRUB (5% – very open) Betula pumila (5%) HERB (60% semiclosed to semiopen) MOSS (70%) – Betula pumila (suckers) (20%) – Salix pedicellaris (20%) – WATER (5%) – Carex diandra (13%) – Carex limosa (5%) – Menyanthes trifolia (5%) – Equisetum fluviatile (3%) – Triglochin maritima (3%) – Carex aquatilis (2%) – Eriophorum viridi-carinatum (2%) – Parnassia palustris (2%) – Pedicularis groenlandica (2%) – Platanthera hyperborea (1%) – Phleum pratense (1%) – Salix candida (1%) – Tofieldia glutinosa (1%) – **Drosera linearis** (originally determined as D. anglica) (0.5%) – Muhlenbergia glomerata (0.5%) – Aster borealis (0.1%)

map/date site: Dl3 - Droslin-86xxxxa
location: Wainwright Dunes Ecological Reserve // extensive wetland to the NW of David // see map Dl3
source: —
reference: Cottonwood Consultants, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton.
observation: C. Wallis 1986
collection: no information
photo: no information
plant numbers: no information
note: none
habitat: extensive beaverpond and fen complex
comment: no accurate location indicated by Cottonwood 1986 in its Significant Features map; this locality about 52°36.100'N / 110°38.400'W ("0.1') (map)

map/date site: Dl4 - Droslin-86xxxxb
location: Wainwright Dunes Ecological Reserve // extensive wetland to the NW of David // about SW5-10-2-5W4 // see map Dl4
source: Cottonwood Consultants, Ltd.. 1986.
reference: Cottonwood Consultants, Ltd.. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton.
observation: no information
collection: no information
photo: no information
plant numbers: no information
note: none
habitat: patterned fen in extensive beaverpond and fen complex
comment: the Significant Features map in Cottonwood 1986 indicated this locality to be about 52°35.900'N / 110°38.400'W ("0.1') (map)

map/date site: Dl5 - Droslin-90xxxxa
location: Wainwright Dunes Ecological Reserve // NW of David Lake (Great Fen area) // T41-R5-W4 & T42-R5-W4 // UTM27 524300E 5827550N // see map Dl5
source: ANHIC // Element Occurrence PDDRO02060 # 019
reference: Wallis, C. 1990. Reconnaissance Survey of Saline Wetlands and Springs in the Grassland-Parkland Region of Eastern Alberta // reference source

code U90WAL01ABCA
observation: C. Wallis 1990
collection: no information
photo: none
plant numbers: no information
note: (Wallis recommended) "protect entire wetland basin with sufficient setback; reduce grazing pressure on meadows on lake"
habitat: "wet saline and subsaline meadows along lake; higher edges and hummocks" // elev: 665 m
comment: location is in the Great Fen, 300 m NW of the large pond, but habitat indicated that it was in vicinity of the "lake", i.e., the beaver pond; this probably is the same location as Fehr's report in his Stand 055 (see DI2 above)

RECENTLY DISCOVERED SPECIES LOCATIONS

map/date site: DI6 – Droslin-020721a
location: Wainwright Dunes Ecological Reserve; 2.3 km NNW of David Lake peninsula's southern tip; 6-, 7-, 9-, 10-10-2-42-5W4; see map DI5
lat./long.: (centre) 52°36.000'N / 110°38.500'W ("0.025') (GPS)
collection: none
photos: B14 (general habitat: hygric shrubby graminoid fen and thicket fen, early summer, 15 June 2003) P23 (general habitat: hygric patterned fen in tall thicket swamp, late summer, 19 August 2003)
plant numbers: no plants observed in the general basin
note: this is the same fen habitat reported by Fehr (1984) and Cottonwood Consulting, Ltd. (1986); note also presence of Minuartia dawsonensis, Silene menziesii, Galium labradoricum; NO individual plants recorded in 2002!
habitat: extensive hygric to subhydric organic basin with thicket and shrubby graminoid fen features and scattered ancient beaver lodges and dam features supporting tall thickets (note also that this is only a general listing of the 86 species recorded by the author from basin and is not a formal quadrat-based survey)
SHRUBS: Juniperus horizontalis, Salix candida, Salix discolor, Salix lutea, Salix maccalliana, Salix myrtillifolia var. cordata, Salix pedicellaris, Salix petiolaris, Salix planifolia subsp. planifolia, Salix pseudomonticola, Salix serissima, Betula occidentalis var. occidentalis, Betula pumila var. glandulifera, Ribes lacustre, Rosa acicularis, Viburnum edule

FERNS: Equisetum fluviatile, Equisetum variegatum subsp. variegatum
GRAMINOIDS: Typha latifolia, Triglochin maritimum, Agropyron trachycaulum var. subsecundum, Bromus ciliatus, Calamagrostis inexpansa, Muhlenbergia glomerata, Poa pratensis var. pratensis*, Sphenopholis intermedia, Carex aquatilis var. aquatilis, Carex aurea, Carex bebbii, Carex canescens, Carex capillaris subsp. chlorostachys, Carex chordorrhiza, Carex diandra, Carex disperma , Carex gynocrates, Carex interior, Carex lanuginosa, Carex leptalea, Carex limosa, Carex prairea, Carex tenuiflora, Carex utriculata, Carex vaginata, Eriophorum gracilis, Eriophorum polystachion, Eriophorum viridi-carinatum, Juncus longistylis
FORBS: Smilacina trifolia, Tofieldia glutinosa var. glutinosa, Corallorhiza trifida, Cypripedium calceolus var. parviflorum, Habenaria dilatata, Habenaria hyperborea, Habenaria obtusata, Rumex occidentalis, Minuartia dawsonensis, Moehringia lateriflora, Silene menziesii var. menziesii, Stellaria crassifolia, Stellaria longifolia, Stellaria longipes, Cardamine pensylvanica, **Drosera linearis** (reported, not seen), Drosera anglica (reported, possibly in error, not seen), Mitella nuda, Parnassia palustris var. neogaea, Potentilla palustris var. palustris, Rubus pubescens, Viola renifolia, Epilobium angustifolium subsp. angustifolium, Epilobium leptophyllum, Aralia nudicaulis, Cornus stolonifera var. stolonifera, Orthilia secunda subsp. secunda, Pyrola asarifolia var. asarifolia, Arctostaphylos uva-ursi, Lysimachia thyrsiflora, Menyanthes trifoliata, Pedicularis groenlandica, Galium boreale var. intermedium, Galium labradoricum, Galium trifidum var. trifidum, Galium triflorum, Linnaea borealis var. americana, Lonicera dioica var. glaucescens, Aster borealis, Solidago canadensis var. canadensis

Photos: Photographs of habitats and plant locations for *Drosera linearis* in the Wainwright Dunes Ecological Reserve

- Dr6 – Droslin-020615a
    - B14 (general habitat: hygric shrubby graminoid fen and thicket fen, early summer, 15 June 2003)
    - P23 (general habitat: hygric patterned fen in tall thicket swamp, late summer, 19 August 2003)

Gentiana fremontii **Torr.—marsh gentian—*GENTIANACEAE***

This very short biennial herb of wet calcareous meadows has a provincial Rank of **S2S3** in Alberta, and a global Rank of **G4** (Vujnovic & Gould 2002, ANHIC 2002). This is one of the smallest gentians in the province, reaching only up to 10 cm tall, and is semiprostrate to erect, with opposite, small, scale-like, ovate leaves. It has single small greenish-purple to white flowers at the stem tips, and capsules that flare at their tips. This species differs from the related *Gentiana prostrata* of the Rocky Mountains, in having scarcely recurving, white-margined or scarious leaves (rather than distinctly recurving, green-margined in this species), and a capsule that is sessile (rather than on a distinctly elongated stalk). Young plants may be mistaken for a variety of young herb species, notably members of the *Caryophyllaceae* which also have small, opposite leaves, but thattend not to arise from a small glabrous basal rosette and have separate petals. Indeed, finding this species in its shrubby or meadow habitats is difficult due to its small size. This species has been known as *Gentiana aquatilis auct., non* L., and was treated under *Gentiana prostrata* Haenke *ex* Jacq. var. *americana* Engelmann in the *Flora of Alberta* of Moss (1983).

This species occurs in the western third of North America and also in eastern Asia. In Canada it is rare in the two or the four provinces in which it occurs, Alberta and Saskatchewan, and in the United States it is rare in two of the seven states where it occurs (NatureServe 2003, Kershaw *et al.* 2001). As well, Argus and Pryer (1990) included this species in their list of nationally rare species. In Alberta it has been recorded from ten known locations in the Parkland Natural Region's western portion, with the Wainwright Dunes Ecological Reserve being the only report from its eastern portion (ANHIC 2003). It was first recorded within the reserve by Fehr (1984) from a 1983 collection on the north shore of David Lake, and next by Cottonwood Consultants, Ltd. (1986) who indicated it on the significant features map, and had a 1986 specimen collection by C. Wallis from the vicinity of the peninsula's eastern offshore. Unfortunately, the label reference information is vague or contradictory for both these locations, stating in words the north shore of David Lake, but giving sectional or UTM27 locations removed from the lake or their described habitat (ANHIC 2002). The current survey did discover three general locations for the species, with two sampled locations within the Ecological Reserve's boundaries on the northern and southwestern sides of David Lake's backshore, and two proximate locations just 175 m to the east of the Reserve's boundary on the lake's northern backshore.

There is no information on the number of plants in the previously discovered locations for this species, except to indicate that they were "occasional". The current survey discovered a total of at least 329 individual plants in 2002; however, only three plants were at two locations within the Reserve boundaries, and the rest were outside the boundaries. Given the difficulty of seeing this very small species in the thicket and graminoid meadow undergrowth, the populations undoubtedly were under-sampled. In the two locations within the boundaries, only one or two plants were discovered within large sampled polygons that were 15 m X 40 m and 10 m X 30 m. However, it is likely that the number of individual plants is larger, particularly in light of the species location discovered just barely outside the Reserve, where a 15 m X 25 m sample in the habitat enclosed 142 counted plants in 29 clusters, and another sample had 184 plants counted in 24 small clusters in a 10 m X 107 m area. Over the entire 110 m X 500 m area of the tall thicket zone along this portion on the David Lake north backshore, there probably were well over 1 000 plants. The phenology of the plants here had flowering plants in Fehr's collection from late May 1983 and Macdonald's record from mid-July 2002, although these probably represent the extreme begining and end to the flowering period, which normally would be in June. In 2002, fruit were developing prior to early July and probably matured into late July, with well over 20% of the population at mid-fruiting by mid-July, and all seeds matured and shed by mid-August.

Wallis' 1990 study of saline wetland and spring habitats indicated that this is a "facultative wetland species, scarce in saline seepage meadows, most frequent along drier edge in wire rush (*Juncus balticus*) communities". The collection of A. Fehr at the Alberta Parks and Protected Areas herbarium was from a "hummocky *Betula* (*occidentalis*) – *Salix* (?*maccalliana* or ?*pseudomonticola*)" fen which was either associated with the David Lake backshore or was in a depression on the sandlands to the north of the lake. C. Wallis' collection at the University of Alberta herbarium indicated that the habitat was "hummocks and moist meadows (dominated by *Antennaria*, occurring) along the lake". The 2002 survey sampled the hummocky meadows both in the near- and offshore situations along the eastern portion of the David Lake peninsula and the northern side of David Lake, but no populations of this species were recorded. These backshore meadows were dominated by *Deschampsia cespitosa, Juncus balticus, Agropyron trachycaulum, Potentilla anserina, Crepis runcinata*, and others, while the offshore meadows were dominated by *Juncus balticus, Potentilla anserina, Glaux maritima, Agropyron trachycaulum, Deschampsia cespitosa, Puccinellia nuttalliana* and *Hordeum jubatum*. Additionally the well-developed hummocky terrain of the seepage slopes on the peninsula also was searched, but without success. In wetter climatic conditions these sites were hygric with flowing, calcareous surface water. The meadows now, however, supported a much drier complement of species, including the notable carpets of *Antennaria parvifolia* indicated by Wallis, with Juncus balticus, Distichlis stricta, Calamagrostis stricta, Carex scirpoidea, Glaux maritima, several of the calcareous fen species, such as *Primula incana, Lobelia kalmii* (Kalm's lobelia), *Carex aurea, Senecio pauperculus*, and even the rare *Carex parryana*. The hummock terrain was probably formed by the trampling of cattle through the soft soils as part of their grazing pattern; in many instances these hummocks are over 25 cm or 35 cm tall. The *Gentiana fremontii* plants probably would occur on the crests or sides of these hummocks; however, the species was not recorded from these habitats in 2002, probably due to their now very dry moisture regime caused by the prolonged drought conditions. The plants that were discovered during the 2002 survey occurred in two general backshore thicket and shrubby graminoid fen habitats. These sites would have had hygric to subhydric moisture regimes in wetter climates, but the severe regional drought reduced the available ground moisture to subhygric conditions, with no sign of flowing ground water. The shrubby graminoid fen community had an very open to semiopen, medium height shrub complement of *Salix maccalliana, Salix pseudomonticola, Salix petiolaris, Salix planifolia* (flat-leaved willow), *Betula occidentalis, Populus balsamifera* saplings and *Salix candida*, and a semiclosed herb cover of *Carex lanuginosa, Carex aurea, Calamagrostis stricta, Juncus balticus, Deschampsia cespitosa, Potentilla anserina, Carex aquatilis, Festuca ?trachyphylla* (tall red fescue), *Solidago canadensis* (Canada goldenrod) and several species associated with the alkaline seepage sites, such as *Carex capillaris* subsp. *chlorostachys, Eleocharis quinqueflora, Parnassia palustris, Primula incana, Senecio pauperculus, Lobelia kalmii, Crepis runcinata, Juncus longifolius, Dodecatheon pulchellum, Gentiana crinita, Gentianella amarella* and others, including the rare *Lycopus americanus* and *Carex crawei*. The tall thicket community on the lake's northern backshore habitat presented a semiopen tall shrub cover of *Salix maccalliana, Betula occidentalis* and *Populus balsamifera* saplings, a semiopen lower shrub cover that included the above tall shrub species and *Salix petiolaris* and *Salix pseudomonticola*, and a semiclosed to closed herb cover of *Deschampsia cespitosa, Juncus balticus, Potentilla anserina, Carex aurea, Carex scirpoidea, Carex capillaris* and many of the calcareous seepage slope species indicated above, but with a more sparse presence. It is likely that this tall thicket community on the lake's northern backshore originally extended eastward from the reserve's eastern boundary onto the now open shrubby graminoid meadow that had the much larger population of *Gentiana fremontii*. A conversation with the rancher who has been stewarding the area indicated that this area had been cleared of growth in the past ten years, and that the more open shrubby growth had developed since then (Maull 2002).

The major habitat threat to the species in the Reserve is associated with the long-term regional drought conditions that have caused a considerable drawdown of the lake's water level, resulting in a notable lowering of the water table and change in the moisture regime from subhydric to subhygric. As well, the surface water seepage from the springs that previously was prevalent, had virtually ceased. The effect on the habitats has been enough to encourage the species cover values to change, more mesic species to invade, and the species to be exposed to more extreme temperature changes. The clearing of the potential habitats along the northern shore of David Lake may have had both desirable and undesirable effects on the populations. It is apparent that the known population in the cleared area now has quite an impressive size, perhaps due to the 'releasing' effects of opening the canopy. However, such clearing also may have eliminated other features. Actual grazing in the habitats did not appear to have had direct effects on the populations of this rare plant; its small size certainly does not expose it to aggressive selection for forage.

Management considerations here must involve monitoring the known species locations, both within and beyond the immediate Reserve boundaries, resurveying the formerly reported hummocky meadow sites when the drought conditions decline, determining the actual impact of the drought on the species' survival, and evaluating the impact of the clearing procedures on the lake's northern backshore thicket habitat for the species.

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Gentiana fremontii* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	not applicable (1)
Flood Hazard	not apply
Soil Drainage	imperfectly drained (5), poodly drained
Perviousness	moderately (2)
Site: Macro	not apply
Site: Meso	level (7)
Site: Micro	hummocky (2), straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	hygric (7), subhydric (8)
Nutrients	?permesotrophic (4), mesotrophic (3)
Successional Status: 1	?young edaphic (6)
Successional Status: 2	not apply
Disturbance Factors	water (8), site imrpovement (7)

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	mid- to late May
Phenology: reproductive – inflorescence	mid-May to mid-July
Phenology: reproductive – flower	late May, to mid-July
Phenology: reproductive – fruit	late June, to early, mid- to late July
Habitat Threats	drought drawdown of lake; habitat clearing; grazing
Management Considerations	monitoring populations; drought impact

Species location summary for *Gentiana fremontii* in the Wainwright Dunes Ecological Reserve (+ indicates adjacent to ecological reserve)

map site / date site	location coordinates	number (size)	habitat
Gf1 – Gentfre-830527a	SE-11-42-5W4	no information	hummocky thicket fen Betula – Salix
Gf2 – Gentfre-860614a	UTM27 526500 5826250	no information	hummocks & moist meadows along lake
Gf3 – Gentfre-86xxxxa	no information	no information	lower hill slope seepage fen
Gf4 – Gentfre-90xxxxa	N shore David Lake, vicinity	no information	saline spring
Gf5 – Gentfre-020613d	52°35'07.5"N 110°37'00.5"W	none seen	hummocky hygric meadow
Gf6 – Gentfre-020613e	52°35'09.4"N 110°37'00.4"W	none seen	hummocky hygric meadow
+Gf7 – Gentfre-020710e	52°35.325′N 110°36.145′W	142 (15m X 25m)	seepage backshore thicket fen
+Gf8 – Gentfre-020811a	52°35.380′N 110°36.135′W	184 (10m X 107m) (possibly 1000)	seepage backshore thicket fen
Gf9 – Gentfre-020815f	52°35.412′N 110°36.508′W	1 (15m X 40m)	lake backshore fen tall thicket
Gf10 – Gentfre-020818d	52°34.628′N 110°37.244′W	2 (10m X 30m)	lake backshore fen open thicket

Map: Species locations for *Gentiana fremontii* in the Wainwright Dunes Ecological Reserve (o indicates approximate reported location)

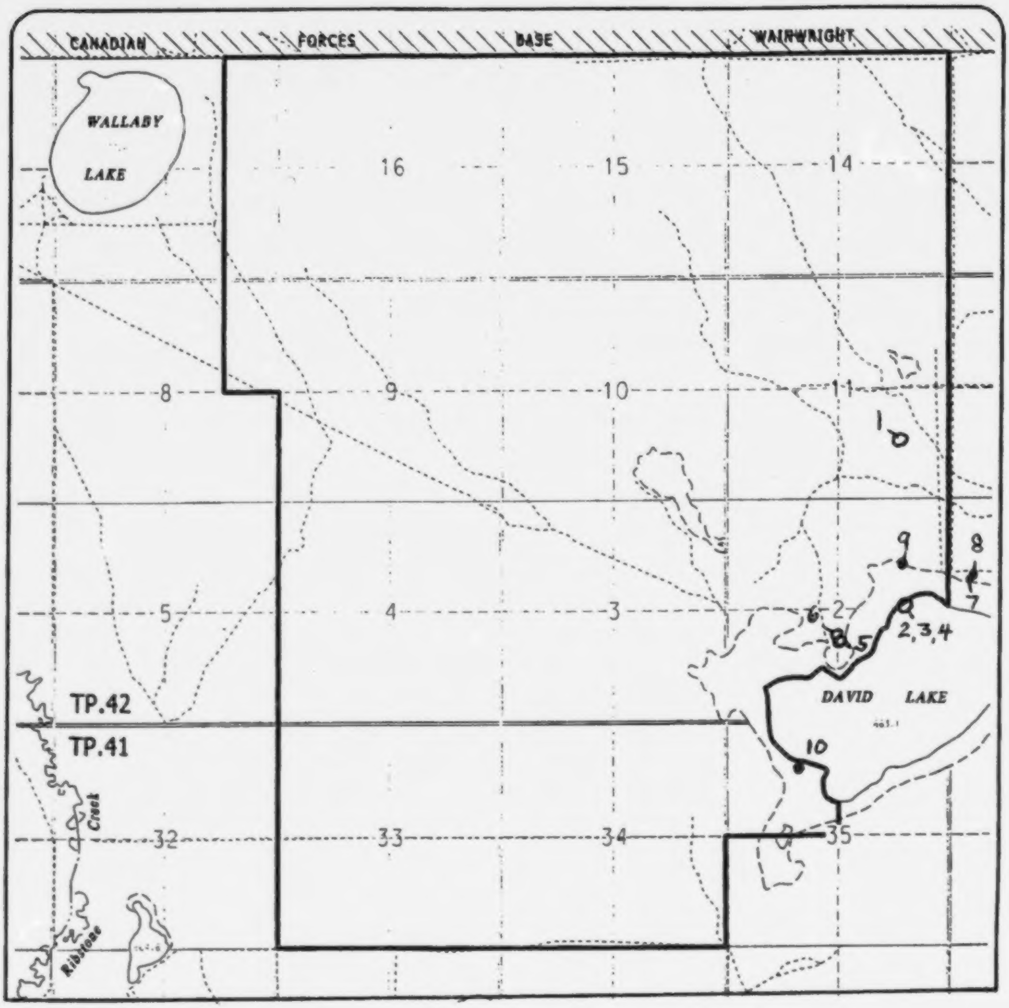
CANADIAN FORCES BASE WAINWRIGHT
WALLABY LAKE
16
15
14
8
9
10
11
5
4
3
2
TP.42
TP.41
32
33
34
35
DAVID LAKE
Ribstone Creek
1
2,3,4
5
6
7
8
9
10

Photo: *Gentiana fremontii* plant detail: growth habit at mid-flower (Gf8 – Gentfre-020711a–E7, photo Ian D. Macdonald)

PREVIOUSLY REPORTED SPECIES LOCATIONS

map/date site: Gf1 – Gentfre-830527a
location: Wainwright Dunes Ecological Reserve // N shore of David Lake (see below) // SE11-42-5W4 // see map Gf1
source: Fehr, . (collection at PP)
reference: —
observation: A. Fehr 27 May 1983
collection: Fehr, A. s.n. // 27 May 1983 // PP- (no number) // det: K.E. Tannas // vidi & stet IDM-02
photo: no information
plant numbers: "occasional"
note: "Rocky Mountains / Prairies"
habitat: "hummocky Betula – Salix fen"*
comment: this specimen not entered into ANHIC data base; specimen at Alberta Parks herbarium; the location above would be approximately 700 m to 1.5 km N of the David Lake north shore where there are wetland thickets in sandland depressions; no plants rediscovered in this general area during 2002 survey; * the vegetation would be Betula (occidentalis)! - Salix (maccalliana)?; see also Gentfre-020815f

map/date site: Gf2 – Gentfre-860614a
location: Wainwright Dunes Ecological Reserve // David Lake // T41-R5-W4 & T42-R5-W4 // UTM27 526500E 5826250N // see map Gf2
source: ANHIC // Element Occurrence PDGEN060Y0 # 003
reference: Cottonwood Consulting, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton.
observation: C. Wallis 1986
collection: Wallis, C. 1986-06-14 // UA# 098392 // det OK // specimen source code S86WALUAABCA06
photo: no information
plant numbers: no information
note: "flowering"
habitat: "hummocks and moist meadows along lake dominated by Antennaria" // elev: 665 m
comment: this location would be in the offshore zone of the northern end of David Lake, probably closer to the actual high level shoreline; no plants rediscovered at this location during 2002 survey

map/date site: Gf3 – Gentfre-86xxxxxa
location: Wainwright Dunes Ecological Reserve // reported from slope north of David Lake in seepage fen hillside // see map Gf3
source: ANHIC // Element Occurrence PDGEN060Y0 # 003
reference: Cottonwood Consultants, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton AB.
observation: C. Wallis 1986
collection: Wallis, C. 1986-06-14 // UA# 098392 // det OK // (see above)
photo: no information
plant numbers: no information
note: (Fehr's 1984 report alludes to this slope seepage fen, but does not list the species from here)
habitat: "lower hill slope seepage fen"
comment: no relocation information available

map/date site: Gf4 – Gentfre-90xxxxa
location: Wainwright Dunes Ecological Reserve // David Lake // T41-R5-W4 & T42-R5-W4 // UTM27 526500E 5826250N // see map Gf4
source: ANHIC // Element Occurrence PDGEN060Y0 # 003
reference: Wallis, C. 1990. Reconnaissance Survey of Saline Wetlands and Springs in the Grassland-Parkland Region of Eastern Alberta. source code U90WAK01ABCA
observation: C. Wallis 1986
collection: no information
photo: none
plant numbers: no information
note: flowering
habitat: hummocks and moist meadows along lake dominated by Antennaria // elev: 665 m
comment: this location would be on the actual shoreline of the northern end of David Lake; no plants rediscovered during 2002 survey; this refers to the Cottonwood Consulting, Ltd 1986 report

RECENTLY DISCOVERED SPECIES LOCATIONS

map/date site: Gf5 – Gentfre-020613d
location: Wainwright Dunes Ecological Reserve; NW side of David Lake at neck of the peninsula, ca 100 m N of peninsula's southern tip and ca 25 m SW of

the aspen grove; 7-2-42-5W4; see map Gf5
lat./long.: (centre) 52°35'07.5"N / 110°37'00.5" (0.025') (GPS)

collection: none

photo: see also Carex parryana photos; A24 (habitat detail: now-subxeric seepage slope hummock site, looking N) A25 (habitat detail: now-subxeric seepage slope hummock site, looking NW) A26 (habitat detail: now-subxeric seepage slope hummock site, scale to pen)

plant numbers: no plants recorded in 2002; this is a formerly reported general habitat and location

note: reported to be the habitat and possibly the location of Gentiana fremontii for previous sightings of the gentian, but due to the drought conditions, none observed during 2002; associated with Carex parryana; hummock landform created by grazing cattle trampling when site is moister; see Carex parryana 020613c

habitat: very gentle seepage slope, now essentially dry, with alkaline sand hummocks having a closed meadow of 50–75% Distichlis stricta – Antennaria parvifolia; 5-20% Agropyron trachycaulum – Carex ?stenophylla; 1-5% Carex scirpoidea – Deschampsia cespitosa; <1% Smilacina stellata – Cirsium flodmanii – Poa pratensis – Equisetum arvense – Anemone ?multifidum – Thalictrum venulosum – Anemone cylindrica – Solidago missouriensis – Aster ericoides – Sonchus uliginosus – Juncus balticus – Potentilla pensylvanica – Glaux maritima – Achillea millefolium – Artemisia frigida – Calamagrostis ?inexpansa – Taraxacum officinale – Silene drummondii – Symphoricarpos occidentalis – Juniperus horizontalis – Salix ?petiolaris

map/date site: Gf6 – Gentfre-020613e

location: Wainwright Dunes Ecological Reserve; NW side of David Lake at neck of peninsula, ca 100 m N of its southern tip; 7-2-42-5W4; see map Gf6
lat./long.: (centre) 52°35'09.4"N / 110°37'00.4" (0.025') (GPS)

collection: 020613a9 (research notes indicated collection made, but no specimen found)

photo: A27 (habitat detail: now-subxeric seepage slope hummock site, scale to clipboard, see Carex parryana photos)

plant numbers: not observed in 2002; this is a formerly reported habitat and general location

note: associated with Carex parryana; reported to be the habitat and possible location for previous sightings of the gentian, but due to the drought conditions, no gentian plants observed during the survey; hummock landform created by grazing cattle trampling when site is moister

habitat: very gentle seepage slope, now essentially dry, with alkaline sand hummocks having closed meadow of >75% Antennaria parvifolia; 5–20% Distichlis stricta – Carex stenophylla; 1–5% Agropyron trachycaulum – Carex scirpoidea – Deschampsia cespitosa; <1% Artemisia frigida – Symphoricarpos occidentalis – Calamagrostis inexpansa – Carex ?obtusata – Carex parryana

map/date site: Gf7 – Gentfre-020710e

location: adjacent to Wainwright Dunes Ecological Reserve, 175 m east of eastern boundary, ca 1.1 km NE of David Lake peninsula southern tip; SW12-1-42-5W4; see figure and map Gf7

lat./long.: (centre) 52°35.325'N / 110°36.145'W (0.025') (GPS)

collection: 020710e1 (3 replicates @ UAC IDM ALTA / root / stem: full, 5–10 cm / leaf: full)

photos: D19 (general habitat: backshore shrubby graminoid seepage fen, looking NE, pink flags mark plant locations) D20 (general habitat: backshore shrubby graminoid seepage fen, looking S toward David Lake, pink flags mark plant locations) D21 (general habitat: backshore shrubby graminoid seepage fen, looking N toward backshore poplar forest, pink flags mark plant locations) D22 (habitat detail: backshore shrubby graminoid seepage fen, scale to ruler, red pen at plant locus, note ant hummock nearby) E3 E4 E5 E6 (plant detail: growth habit and young fruit)

plant numbers: 142 plants counted in 29 clusters in 15 m X 25 m area; clusters have 1 to 8 plants with 30% having mature inflorescences at early to mid- to late fruiting

note: see also Gentfre-020711a; soil is a peat with reducing smell; ground water table apparently at over 40 cm deep; plants are in the grassy areas between the shrub bases, not associated with the low vaguely defined hummocks; this area intensively surveyed

habitat: drawdown lake backshore subhygric seepage shrubby graminoid fen marsh of TALL SHRUB (extremely open) <1% Salix maccalliana – Populus balsamifera (saplings); LOW SHRUB (semiopen) 20–50% Salix maccalliana – Salix pseudomonticola – Salix petiolaris – Betula occidentalis; 5–20% Salix petiolaris; <1% Populus balsamifera (seedlings) – Salix candida; HERB (semiclosed to closed); 20–50% LITTER – Juncus balticus – Carex lanuginosa; 5–20% Carex aurea – Carex viridula – Eleocharis quinqueflora; 1–5% Solidago canadensis – Potentilla anserina; <1% Sonchus uliginosus – Primula incana – Muhlenbergia glomerata – Crepis runcinata – Aster borealis – **Gentiana fremontii** – Senecio pauperculus – Deschampsia cespitosa – Viola nephrophylla – Calamagrostis stricta – Juncus longifolia – Juncus alpinoarticulatus – Salix bebbiana (seedlings) – Platanthera ?hyperborea – Platanthera obtusata – Equisetum arvense – Achillea millefolium – Petasites sagittata – Pyrola asarifolia – Triglochin palustris – Gentianella amarella – Festuca trachyphylla – Pedicularis groenlandica – Lobelia kalmii – Gentiana ?crinita – Thalictrum venulosum

map/date site: **Gf8 – Gentfre-020711a**

location: adjacent to Wainwright Dunes Ecological Reserve; north side of David Lake backshore, about 170 m east of Wainwright Dunes Ecological Reserve eastern boundary ca 1.1 km NE of David Lake peninsula southern tip; SW12-1-42-5W4; see figure and map Gf8
lat./long.: (centre) 52°35.380'N / 110°36.135'W (0.025') (GPS)

collection: none

photos: E7 (plant detail: growth habit at mid-flower) E8 (habitat detail: backshore shrubby graminoid seepage fen, note capsules, scale to ruler) F1 (general habitat: backshore shrubby graminoid seepage fen, looking S toward David Lake, pink flags mark plant locations) F2 (general habitat: backshore shrubby graminoid seepage fen, looking N toward backshore poplar forest, pink flags mark plant locations)

plant numbers: 184 plants counted in 24 clusters in 10 m X 107 m area; 1 plant in flower and 50 in mid- to late fruiting; probably many more (1 000 plants?) within the 110 m X 500 m area of the tall thicket zone along the David Lake north backshore

note: associated with Carex crawei (020711b); see also Gentiana fremontii sample 020710e; this is a sampling of one 10 m wide X 107 m long strip in the much larger tall thicket area (since this location was outside Reserve it could not be sampled in its entirety); local rancher (Hilson Maull) indicated this entire tall thicket has developed since clear cutting and brushing out in the past decade of the then existing balsam poplar forest that occupied this backshore site; slow seepage rate on calcareous sand, probably hygric with higher lake levels; cattle grazing as local swaths over 10% of the surface area

habitat: drawdown lake backshore subhygric seepage shrubby graminoid fen marsh of TALL SHRUB (extremely open) 1-5% Salix maccalliana – Salix petiolaris – Betula occidentalis; LOW SHRUB (semiopen) 20-50% Salix maccalliana – Salix petiolaris; 5-20% Betula occidentalis; 1-5% Salix pseudomonticola – Populus balsamifera (saplings); <1% Salix planifolia –

Salix candida; HERB (semiclosed) 20–50% LITTER; 5–20% Carex lanuginosa – Carex aurea – Eleocharis quinqueflora – Juncus balticus – Salix pseudomonticola (seedlings); 1–5% Crepis runcinata – Carex capillaris subsp. chlorostachys – Carex aquatilis – Salix candida (seedlings) – Calamagrostis stricta – Deschampsia cespitosa – Sonchus uliginosus – Senecio pauperculus – Potentilla anserina – Festuca trachyphylla; <1% Aster borealis – Primula incana – Viola nephrophylla – Carex sartwellii – Salix bebbiana (seedlings) – Muhlenbergia glomerata – Sisyrinchium montanum – **Gentiana fremontii** – Solidago canadensis var. canadensis – Equisetum arvense – Pyrola asarifolia – Populus tremuloides (seedling) – Polygonum amphibium var. stipulaceum – Habenaria hyperborea – Poa pratensis – Triglochin maritima – Rosa woodsii (sapling) – Poa interior – Puccinellia nuttalliana – Eleocharis palustris – Carex crawei – Agoseris glauca

map/date site: **Gf9 – Gentfre-020815f**

location: Wainwright Dunes Ecological Reserve; north end of David Lake backshore, ca 800 m NNE of peninsula's southern tip; NW9-2-42-5W4; see figure and map Gf9
lat./long.: (centre) 52°35.412'N / 110°36.508'W (0.025') (GPS)
UTM27: (centre) 12N 0526525E 5826540N (30m) (GPS)

collection: none

photo: none

plant numbers: 1 plant seen in 15 m X 40 m area sampled, probably many more; with old fruit development having capsule fully open

note: in association with Lycopus americanus (0208915f); many species associated with the seepage slope habitat also present; situated between balsam poplar – trembling aspen forest (70 m to north) and the Deschampsia cespitosa lake backshore meadow (35 m to the south); signs of light and local grazing (30% intensity)

habitat: drawdown lake backshore subhygric seepage tall thicket of TALL SHRUB (semiopen) 5–20% Salix maccalliana – Betula occidentalis – Populus balsamifera (saplings); LOW SHRUB (semiopen) 5–20% Salix petiolaris – Betula occidentalis – Populus balsamifera (seedlings) – Salix maccalliana – Salix pseudomonticola; HERB (semiclosed to closed) 5–20% LITTER – Muhlenbergia richardsonii – Deschampsia cespitosa – Juncus balticus – Potentilla anserina – Carex aurea; 1–5% Carex scirpoidea – Carex capillaris subsp. chlorostachys – Fragaria virginiana – Agropyron trachycaulum subsp. trachycaulum – Crepis runcinata – Glyceria striata – Carex viridula – Viola nephrophylla – Sonchus uliginosus – Eleocharis quinqueflora; <1% Equisetum arvense – Juncus longifolius – Carex utriculata – Lycopus americanus – Senecio pauperculus – Parnassia palustris – Solidago canadensis – Lobelia kalmii – Poa interior – Antennaria parvifolia - Taraxacum officinale – Dodecatheon pulchellum – Sisyrinchium montanum – Glaux maritima – Aster borealis – Gentianella amarella – Platanthera hyperborea – Galium boreale – Juncus nodosus – Muhlenbergia glomerata – Mentha arvensis – Vicia americana – Rosa acicularis – **Gentiana fremontii**

map/date site: **Gf10 – Gentfre-020818d**

location: Wainwright Dunes Ecological Reserve; SW end of David Lake, ca 900 m SSW of David Lake peninsula's southern tip; SE14-35-41-5W4; see figure and map Gf10
lat./long.: (centre) 52°34.628'N / 110°37.244'W (0.025') (GPS)
UTM27: (centre) 12N 0525703E 5825081N (30m) (GPS)

collection: none

photo: O24 (plant detail: growth habit with branching and mature fruit development) P17 (general habitat: lake backshore subhygric shrubby meadow, looking E, pink flags mark plants) P18 (general habitat: lake backshore subhygric shrubby meadow, looking S, pink flags mark plants)

plant numbers: 2 plants separated by 7 m counted in 10 m X 30 m area sampled, probably more, but very difficult to see at this season; plant with fully opened, mature capsule

note: in association with Lycopus americanus (020815e); many species associated with the seepage slope habitat present; situated between balsam poplar - trembling aspen forest (60 m to south) and the Deschampsia cespitosa lake backshore meadow (15 m to the north)

habitat: drawdown lake backshore subhygric seepage tall thicket of TALL SHRUB (semiopen) Salix lutea – Betula occidentalis; LOW SHRUB (semiopen, height 0.8 m) Salix lutea – Salix candida – Betula occidentalis; HERB (semiclosed to closed) 20-50% LITTER; 5-20% Carex aurea – Calamagrostis stricta – Carex viridula – Muhlenbergia richardsonii – Deschampsia cespitosa – Juncus balticus – Potentilla anserina; 1-5% SOIL (mucky sand) – Eleocharis quinqueflora – Solidago canadensis – Lobelia kalmii – Parnassia palustris – Crepis runcinata – Sonchus uliginosus – Antennaria parvifolia – Potentilla anserina – Scirpus ?acutus; <1% Glyceria striata – Aster borealis – Dodecatheon pulchellum – Gentianella amarella – **Gentiana fremontii**

Photos: Photographs of habitats and plant locations for *Gentiana fremontii* in the Wainwright Dunes Ecological Reserve

Gentfre-020613d	A24 (habitat detail: now-subxeric seepage slope hummock site, looking N)
Gentfre-020613d	A25 (habitat detail: now-subxeric seepage slope hummock site, looking NW)
Gentfre-020613d	A26 (habitat detail: now-subxeric seepage slope hummock site, scale to pen)
Gentfre-020613e	A27 (habitat detail: now-subxeric seepage slope hummock site, scale to clipboard)
Gentfre-020710e	D19 (general habitat: backshore shrubby graminoid seepage fen, looking NE, pink flags mark plant locations)
Gentfre-020710e	D20 (general habitat: backshore shrubby graminoid seepage fen, looking S toward David Lake, pink flags mark plant locations)
Gentfre-020710e	D21 (general habitat: backshore shrubby graminoid seepage fen, looking N toward backshore poplar forest, pink flags mark plant locations)
Gentfre-020710e	D22 (habitat detail: backshore shrubby graminoid seepage fen, scale to ruler, red pen at plant locus, note ant hummock nearby)
Gentfre-020710e	D23 (detail of graminoid ground cover, for scale)
Gentfre-020710e	E3 (plant detail: growth habit and young fruit)
Gentfre-020710e	E4 (plant detail: growth habit and young fruit)
Gentfre-020710e	E5 (plant detail: growth habit and young fruit)
Gentfre-020710e	E6 (plant detail: growth habit and young fruit)
Gentfre-020711a	E7 (plant detail: growth habit at mid-flower)
Gentfre-020711a	E8 (habitat detail: backshore shrubby graminoid seepage fen, note capsules, scale to ruler)
Gentfre-020711a	F1 (general habitat: backshore shrubby graminoid seepage fen, looking S toward David Lake, pink flags mark plant locations)
Gentfre-020711a	F2 (general habitat: backshore shrubby graminoid seepage fen, looking N toward backshore poplar forest, pink flags mark plant locations)
Gentfre-020818d	P17 (plant detail: growth habit with branching and mature fruit development)
Gentfre-020818d	P18 (general habitat: lake backshore subhygric shrubby meadow, looking E, pink flags mark plants, see Lycopus americanus photos)
Gentfre-020818d	O26 (general habitat: lake backshore subhygric shrubby meadow, looking S, pink flags mark plants)
	P17 (general habitat: lake backshore subhygric shrubby meadow,

looking E, pink flags mark plants)

Asclepias ovalifolia Dcne.—low milkweed—*ASCLEPIADACEAE*

This medium height herb species of open woods, sloped and moist prairies has a provincial Rank of **S3W** in Alberta and a global rank **G5?**, and currently is on the watch list for the province (Vujnovic & Gould 2002; ANHIC 2002, 2003). It is a perennial broad-leaved milkweed which differs from the more common *Asclepias speciosa* (showy milkweed) in having somewhat pubescent, oval-shaped to lanceolate, opposite leaves that are pointed at the tip, but tapered at their base (rather than cordate or rounded), fruit pods that are smooth (rather than having soft tubercles on the surface), flowers that are greenish-white (rather than pink or purplish), and are somewhat smaller in overall size. Additionally, it differs from the provincially rare *Asclepias viridiflora* (green milkweed) which is similar in also having greenish flowers and smooth fruits, but often has additional subterminal inflorescences, cordate leaf bases and no 'horn' structure within the flowers (Moss 1983, Scoggan 1979, Gleason & Cronquist 1991).

This species occurs in the central to west central portions of North America, in five provinces between British Columbia and Ontario, and in ten states along the northern tier of central and midwestern United States. It is rare and possibly extirpated from Ontario, and is rare in five states and is on the provincial Watch list in Alberta (NatureServe 2003, Vujnovic & Gould 2002). In Alberta, it has 26 known locations which occur within the Parkland Natural Region with several in the southern portion of the Boreal Forest Natural Region (Kershaw *et al.* 2001, ANHIC 2003). Several localities within 25 km of the Reserve have been reported (ANHIC 2002). The first reports for this species within the Wainwright Dunes Ecological Reserve were by Bradley & Bradley (1977) and Fehr (1984), but no species locations were given. Cottonwood Consulting, Ltd. (1986) next reported it from the sandlands to the northwest of the Great Fen pond. This report was reiterated in the management plan for the Ecological Reserve (Anon 1998). During the survey in 2002, an additional sixteen species locations were discovered in four general clusters: two about 0.5 km west of David Lake, five about 0.5 km northwest of the Great Fen pond, eight about 1 km north northwest of the Great Fen pond, and one about three km north of David Lake.

The size of the species locations in the Ecological Reserve varied from 1 m X 6 m to 25 m X 40 m, and their numbers from 4 plants to 444 plants. Throughout the Reserve, the total accumulative number of plants was counted as 1 317 plants in 16 the recently sampled locations. In the 2002 survey, their development appeared to have their leaves mostly expanded by mid-June, their inflorescences developed by late June to early July, their flowers mostly at anthesis by early to mid-July and possibly to late July, and fruit development probably normally proceeding between mid- to late July and early to mid-August. However, due to the drought conditions and extreme heat during July 2002, the flowers generally experienced considerable dessication, and essentially had their development toward fruit production arrested by late July. Indeed, none of the species locations investigated during the mid- and late summer of 2002 had any but the most rudimentary fruit development, and in several cases, many flowering inflorescences were abscising from the plant stem by the end of mid-July.

The habitats of its populations most often occurred along the southwest-facing, uppermost slopes and crests of the low sand ridges that supported submesic to subxeric native grasslands that were adjacent to backslope aspen groves and their marginal zones of successional open thickets of *Prunus virginiana* and *Populus tremuloides* saplings. The associated herb cover included *Bouteloua gracilis, Calamovilfa longifolia, Selaginella densa, Koeleria macrantha, Agropyron trachycaulum, Stipa curtiseta, Thermopsis rhombifolia* (golden bean), *Carex pensylvanica* and others. In several instances they also occupied openings in young to subintermediate-aged mesic aspen groves and forests in association with *Selaginella densa, Bouteloua gracilis, Calamovilfa longifolia, Carex pensylvanica, Oryzopsis pungens, Solidago missouriensis, Thermopsis rhombifolia, Schizachne purpurascens, Aster laevis* (smooth aster), *Smilacina stellata* and others.

There do not appear to be any immediate habitat threats to this species within the Ecological Reserve. Wildlife browsing by deer and moose was very minimal, with only two plants recorded as having been nibbled at one location. Trampling along ungulate trails has a potential impact of the plants but was not actually observed during the 2002 survey, and cattle grazing was not evident in the portions of the Reserve where the plant populations occurred.

Management considerations for this species would be limited to monitoring the species' populations and cattle grazing patterns in their habitats, and limiting hiking along the convenient ungulate trails. The succession of an aspen grove cover over the habitats in the future may well shade out the species. Burning in the habitats may affect the aboveground plant parts, although the rhizomes probably would persist to further the survival of the plants at their locations.

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Asclepias ovalifolia* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type (88 89)	not apply
Flood Hazard (90)	not apply
Soil Drainage (91)	rapidly drained (2), well drained (3)
Perviousness (92)	rapidly (1), moderately (2)
Site: Macro (93)	plain (7)
Site: Meso (94)	crest (1), upper slope (2), lower slope (4)
Site: Micro (95)	straight (1)
Site: Surface Shape (96)	convex (3), concave (2)
Ecological Moisture Regime (97)	subxeric (3), mesic (5), submesic (4)
Nutrients (98)	?submesotrophic (2)
Successional Status: 1 (99)	young seral (2)
Successional Status: 2 (101)	not apply
Disturbance Factors (102-106)	fire (4)

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	mid-June
Phenology: reproductive – inflorescence	mid- to late June, early July
Phenology: reproductive – flower	early to mid- to late July
Phenology: reproductive – fruit	late July, early August
Habitat Threats	trampling, grazing, fire
Management Considerations	monitoring populations, limiting access

Species location summary for *Asclepias ovalifolia* in the Wainwright Dunes Ecological Reserve

map site / date site	location coordinates	number (size)	habitat
Ao1 – Asclova-77xxxxa	no information	no information	no information
Ao2 – Asclova-84xxxxa	no information	no information	no information
Ao3 – Asclova-86xxxxa	NE3-10-42-5W4	no information	sand hill grassland
Ao4 – Asclova-	52°34.926'N 110°38.189'W	20	grassy sand ridgecrest

map site / date site	location coordinates	number (size)	habitat
020614e		(5m X 50m)	
Ao5 – Asclova-020614f	52°34.927'N 110°38.418'W	40 (5m X 20m)	grassy sand ridge crest
Ao6 – Asclova-020615g	52°35.839'N 110°38.425'W	13 (3m X 30m)	aspen grove fringe
Ao7 – Asclova-020714b	52°36.457'N 110°38.328'W	444 (25m X 40m)	thicket edge on sand ridge
Ao8 – Asclova-020714c	52°36.472'N 110°38.364'W	117 (7m X 8m)	dune ridge upper slope meadow
Ao9 – Asclova-020714d	52°36.504'N 110°38.402'W	8 (3m X 7m)	dune ridge slope meadow
Ao10 – Asclova-020714e	52°36.568'N 110°38.467'W	14 (4m X 7m)	dune ridge slope meadow
Ao11 – Asclova-020714g	52°36.515'N 110°38.415'W	50 (3m X 5m)	dune ridge slope meadow
Ao12 – Asclova-020715a	52°36.289'N 110°38.440'W	242 (10m X 64m)	dune ridge crest meadow
Ao13 – Asclova-020715b	52°36.320'N 110°38.565'W	16 (6m X 24m)	dune ridge crest meadow
Ao14 – Asclova-020716a	52°36.409'N 110°38.235'W	8 (5m X 12m)	grassy sandland
Ao15 – Asclova-020718d	52°36.928'N 110°36.438'W	26 (20m X 20m)	grassy sand ridge upper slope
Ao16 – Asclova-020720a	52°35.890'N 110°38.537'W	58 (12m X 30m)	dune ridge slope crest
Ao17 – Asclova-020720b	52°35.919'N 110°38.541'W	4 (1m X 6m)	dune ridge aspen grove edge
Ao18 – Asclova-020720c	52°35.919'N 110°38.579'W	71 (8m X 16m)	dune ridge grassland
Ao19 – Asclova-020720d	52°35.948'N 110°38.598'W	186 (10m X 30m)	dune ridge grove opening

Map: Species locations for *Asclepias ovalifolia* in the Wainwright Dunes Ecological Reserve (o indicates approximate reported location)

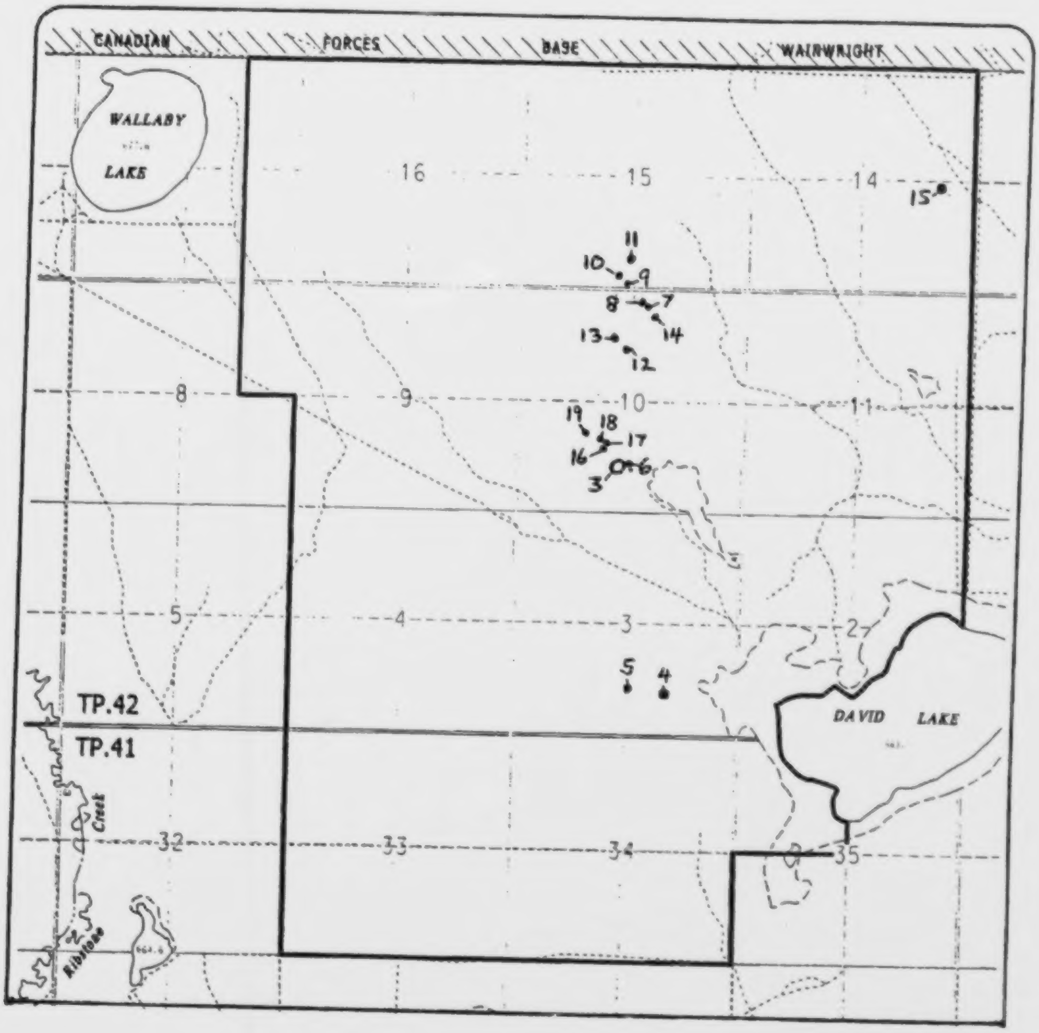
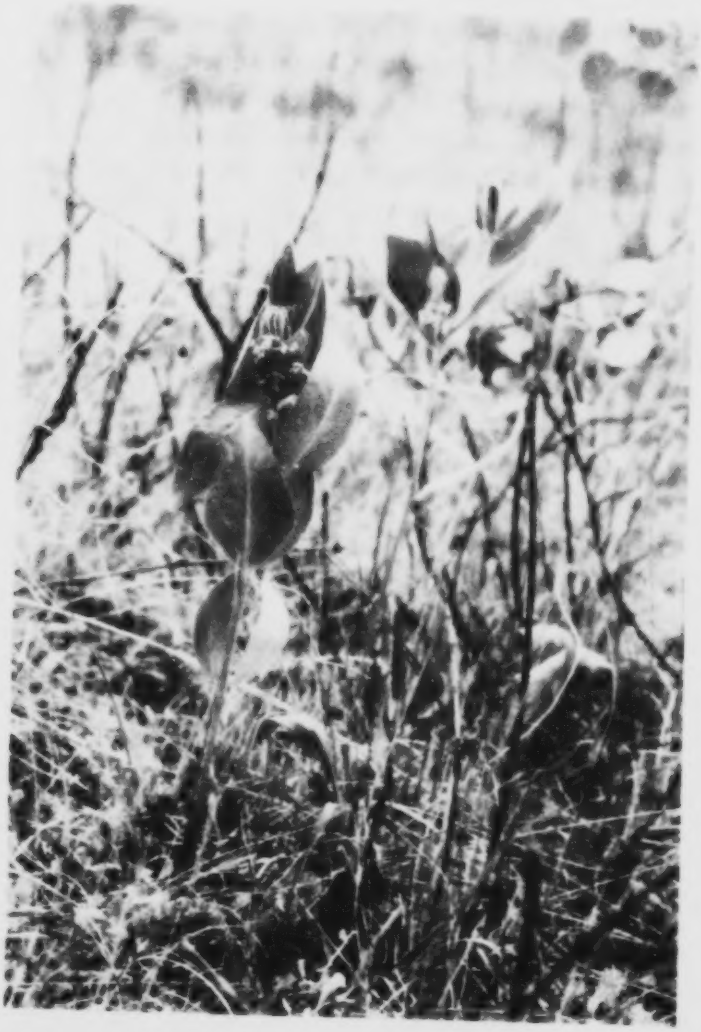

CANADIAN FORCES BASE WAINWRIGHT
WALLABY LAKE
16
15
14
15
11
10
9
8
7
13
14
12
8
9
10
11
19
18
17
16
6
3
5
4
3
2
4
5
DAVID LAKE
TP.42
TP.41
Ribstone Creek
32
33
34
35

Photo: *Asclepias ovalifolia* (low milkweed) plant detail with flowering inflorescence (Ao7—Asclova-020714b-E22, photo Ian D. Macdonald)



PREVIOUSLY REPORTED SPECIES LOCATIONS

map/date site: Ao1 – Asclova-77xxxxa
location: Wainwright Dunes Ecological Reserve // (see comment) // not mapped
source: Fehr, A. 1984. Wainwright Study Area: Biophysical Inventory. Natural Areas Program, Public Lands Division, Alberta Energy and Natural Resources, Technical Report No. t/65, Edmonton.
reference: Bradley, L. and C. Bradley. 1977. Aspen Grove resource assessment: Wainwright area. Parks Planning and Design Branch, Alberta Recreation, Parks and Wildlife, Edmonton.
observation: L. Bradley and C. Bradley, 1977
collection: no information
photo: no information
plant numbers: no information
note: none
habitat: no information
comment: cited in Fehr's general species list; no location or other information

map/date site: Ao2 – Asclova-84xxxxa
location: Wainwright Dunes Ecological Reserve // (see comment) // not mapped
source: Fehr (1984)
reference: Fehr, A. 1984. Wainwright Study Area: Biophysical Inventory. Natural Areas Program, Public Lands Division, Alberta Energy and Natural Resources, Technical Report No. t/65, Edmonton.
observation: A. Fehr, 1983
collection: no information
photo: none
plant numbers: no information
note: none
habitat: no information
comment: cited in Fehr's general species list; no location or other information

map/date site: Ao3 – Asclova-86xxxxa
location: Wainwright Dunes Ecological Reserve // (see comment) // see map Ao3
source: Cliff Wallis 1986
reference: Cottonwood Consultants, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton AB.

observation: C. Wallis 1986
collection: no information
photo: no information
plant numbers: no information
note: none
habitat: no information
comment: The Cottonwood 1986 report maps of significant features places this in the vicinity of NE3-10-42-5W4; species not listed in Fehr's 1984 community stand data

RECENTLY DISCOVERED SPECIES LOCATIONS

map/date site: Ao4 - Asclova-020614e
location: Wainwright Dunes Ecological Reserve; 1.3 km WSW of David Lake peninsula's southern tip; NE2-3-42-5W4; see map Ao5 lat./long.: (centre) 52°34.926'N / 110°38.189'W (0.025') (GPS)
collection: 020614b6 (1 replicate @ ALTA / young plants: 12 - 15 cm / leaf: full / inflorescence: young / flower buds only)
photos: A36 (general habitat: dune ridge grassland, looking SE) A37 (habitat: sand ridge crest grove fringe)
plant numbers: 20 plants counted in 5 m X 80 m area in two groups of 8 (3 m X 10 m) and 12 (3 m X 60 m); 35% in mature inflorescence; population extends to NW
note: general unquantative survey
habitat: sand dune ridge upper slope subxeric sand with semiclosed grassland of Agropyron trachycaulum - Carex stenophylla - Bouteloua gracilis - Stipa curtiseta - Calamovilfa longifolia - Thermopsis rhombifolia - Carex pensylvanica - Smilacina stellata - **Asclepias ovalifolia**

map/date site: Ao5 - Asclova- 020614f
location: Wainwright Dunes Ecological Reserve; 1.6 km WSW of David Lake peninsula's southern tip; NW2-3-42-5W4; see map Ao5 lat./long.: (centre) 52°34.927'N / 110°38.418'W (0.025') (GPS)
collection: none
photo: none
plant numbers: 40 plants counted in 5 m X 20 m area; all vegetative
note: general unquantative survey
habitat: sand dune ridge upper slope and crest subxeric sand with grassland of Calamovilfa longifolia - Bouteloua gracilis - Stipa curtiseta - Carex stenophylla - Selaginella densa - Artemisia frigida - Solidago missouriensis

- Festuca saximontana – **Asclepias ovalifolia**

map/date site: Ao6 – Asclova- 020615g
location: Wainwright Dunes Ecological Reserve; 2.2 km NW of David Lake peninsula's southern tip; NE3-10-42-5W4; see map Ao6
lat./long.: (centre) 52°35.839'N / 110°38.425'W (0.025') (GPS)
collection: 020615a11 (1 replicate @ ALTA / young plants: 18 cm / inflorescence: young, heads only / flower buds only)
photo: none
plant numbers: 13 plants counted in 3 m X 30 m area; none with inflorescence developed
note: none
habitat: sand dune ridge upper slope (3°–5° toward 105° – SSE) and crest subxeric to submesic sand with young semiopen grove of TREE (semiclosed to semiopen) 20–50% Populus tremuloides; SHRUB (semiopen) 20–50% Prunus virginiana – Corylus cornuta – Amelanchier alnifolia; HERB (semiclosed to closed) 50–75% Agropyron trachycaulum – Thalictrum venulosum – Carex siccata; 5–20% Thermopsis rhomboidea – Galium boreale; 1–5% Oryzopsis asperifolia – Aster laevis; <1% Maianthemum canadense – Schizachne purpurascens – Carex pensylvanica – Poa sandbergii – Achillea millefolium – Solidago missouriensis – **Asclepias ovalifolia**

map/date site: Ao7 – Asclova- 020714b
location: Wainwright Dunes Ecological Reserve; 3.1 km NNW of David Lake peninsula's southern tip; NE15-10-42-5W4; see figure and map Ao7
lat./long.: (centre) 52°36.460'N / 110°38.330'W (0.025') (GPS)
collection: 020714b1 (2 replicates @ UAC ALTA / stem: 24–32 cm / leaf: full / inflorescence: mature / flower: mature, stunted due to drought and dessication)
photos: E21 E22 (plant detail with flowering inflorescence) F14 (general habitat: dune ridge crest grassland looking NW, pink flags mark plants) F15 (habitat detail: opening in dune ridge basin grove looking SE, pink flags mark plants)
plant numbers: 444 plants counted in 25 m X 40 m area in three groups of 69 (4 m X 20 m on slope crest grassland), 219 (7 m X 22 m at midslope grassland), 156 (5 m X 8 m in basin grove); 40% in mature inflorescence with flower development, additional plant locations extend to northwest, see 020714c
note: marked by pink ribbon at SE end of site; NE facing back slope of the ridge has aspen forest

habitat 1: sand dune ridge upper slope and crest subxeric sand aspen grove fringe meadow of TREE (extremely open) 1-5% Populus tremuloides; LOW SHRUB (very open) 5-20% Prunus virginiana; 1-5% Juniperus horizontalis; <1% Rosa woodsii; HERB (semiclosed to closed) 50-75% Selaginella densa – Bouteloua gracilis; 5-20% Calamovilfa longifolia – SOIL (sand); 1-5% Koeleria macrantha – Thermopsis rhombifolia – Stipa curtiseta – **Asclepias ovalifolia**; <1% Carex obtusata – Artemisia ludoviciana var. ludoviciana – Cladonia mitis – Heterotheca villosa – Erysimum asperum

habitat 2: sand dune ridge slope basin subxeric sand with successional open grove of TREE (extremely open) 1-5% Populus tremuloides; SHRUB (open) 5-20% Populus tremuloides (sapling) – Prunus virginiana; HERB (semiclosed to closed) 50-75% Selaginella densa – Bouteloua gracilis; 5-20% Calamovilfa longifolia – LITTER – Cladonia mitis; 1-5% Carex pensylvanica – Oryzopsis pungens – Solidago missouriensis – SOIL (sand); <1% Juniperus horizontalis – **Asclepias ovalifolia** – Thermopsis rhomboidea – Schizachne purpurascens – Aster laevis – Achillea millefolium – Artemisia ludoviciana var. ludoviciana – Comandra umbellata var. pallida – Campanula rotundifolia – Silene drummondii

map/date site: Ao8 – Asclova- 020714c

location: Wainwright Dunes Ecological Reserve; 3.1 km NNW of David Lake peninsula's southern tip; NE15-10-42-5W4; see Ao8
lat./long.: (centre) 52°36.472'N / 110°38.364'W (0.025') (GPS)

collection: none

photo: F16 (general habitat: dune ridge crest grassland along aspen grove fringe, looking SE)

plant numbers: 117 plants counted in 7 m X 8 m area; none flowering due to drought

note: none

habitat: sand dune ridge crest subxeric sand with shrubby grassland of LOW SHRUB (open) 5-20% Prunus virginiana; 1-5% Populus tremuloides; HERB (semiclosed to closed) 50-75% SOIL (sand) – Selaginella densa; 5-20% Calamovilfa longifolia – Bouteloua gracilis – LICHEN; 1-5% Cladonia (species) – Koeleria macrantha – Carex obtusata; <1% **Asclepias ovalifolia** – Thermopsis rhombifolia – Heterotheca villosa – Erysimum asperum – Equisetum variegatum – Artemisia frigida – Rosa woodsii – Poa ?sandbergii – Galium boreale – Lithospermum incisum

map/date site: Ao9 – Asclova- 020714d

location: Wainwright Dunes Ecological Reserve; 3.2 km NNW of David Lake peninsula's southern tip; SE3-15-42-5W4; see Ao9

lat./long.: (centre) 52°36.504'N / 110°38.402'W (0.025') (GPS)
collection: none
photo: none
plant numbers: 8 plants counted in 3 m X 7 m area; 3 plant with inflorescence. flowers formed but withered and not abscissed
note: NW end of site marked with pink ribbon
habitat: sand dune ridge crest subxeric sand with shrubby grassland of LOW SHRUB (open) 5–20% Populus tremuloides; HERB (closed to semiclosed) 50–75% Selaginella densa; 5–20% Calamovilfa longifolia – Stipa curtiseta – Bouteloua gracilis – LICHEN; 1–5% Koeleria macrantha – Artemisia frigida; <1% Poa sandbergii – Carex obtusata – Heterotheca villosa – Artemisia campestris subsp. caudata – **Asclepias ovalifolia**

map/date site: Ao10 – Asclova- 020714e
location: Wainwright Dunes Ecological Reserve; 3.2 km of David Lake peninsula's southern tip; SE3–15–42–5W4; see map Ao10
lat./long.: (centre) 52°36.568'N / 110°38.467'W (0.025') (GPS)
photo: F17 (general habitat: dune ridge crest grassland along aspen grove fringe, scale to backpack)
collection: 020714e1 (1 replicate @ UAC / stem: 25–34 cm / leaf: full / inflorescence: mature / flower: stunted due to drought)
plant numbers: 14 plants counted in 4 m X 7 m area; plants all vegetative with narrow leaves due to drought stress
note: marked on NW side by pink tape on aspen
habitat: sand dune ridge crest subxeric sand with grassland of LOW SHRUB (extremely open) 1–5% Prunus virginiana – Populus tremuloides (saplings); HERB (semiclosed to closed) 50–75% LICHEN – Selaginella densa; 5–20% Calamovilfa longifolia; 1–5% Thermopsis rhombifolia – Stipa curtiseta – SOIL (sand); <1% Rhus radicans var. rydbergii – **Asclepias ovalifolia** – Lygodesmia juncea – Carex obtusata – Heterotheca villosa – Lithospermum incisum – Rosa woodsii

map/date site: Ao11 – Asclova- 020714g
location: Wainwright Dunes Ecological Reserve; 3.3 km NNW of David Lake peninsula's southern tip; SE3–15–42–5W4; see map Ao11
lat./long.: (centre) 52°36.515'N / 110°38.415'W (0.025') (GPS)
photo: none
collection: none
plant numbers: 50 plants counted in 3 m X 15 m area; plants all vegetative with narrow leaves due to drought stress

note: marked on NW side by pink tape on aspen

habitat: sand dune ridge crest subxeric sand with grassland of LOW SHRUB (extremely open) 1–5% Prunus virginiana – Populus tremuloides (saplings); HERB (semiclosed to closed) 50–75% LICHEN – Selaginella densa; 5–20% Calamovilfa longifolia; 1–5% SOIL (sand) – Thermopsis rhombifolia – Stipa curtiseta; <1% Rhus radicans var. rydbergii – **Asclepias ovalifolia** – Carex obtusata – Heterotheca villosa – Lygodesmia juncea – Rosa woodsii – Lithospermum incisum

map/date site: Ao12 – Asclova- 020715a

location: Wainwright Dunes Ecological Reserve; 2.8 km NNW of David Lake peninsula's southern tip; NE11-10-42-5W4; see figure and map Ao12
lat./long.: (centre) 52°36.289'N / 110°38.440'W (0.025') (GPS)

collection: none

photo: none

plant numbers: 284 plants counted in 10 m X 64 m area; 10% in mature inflorescence at midflowering

note: none

habitat: sand dune ridge crest subxeric sand with shrubby grassland of SHRUB (very open to semiopen) 5–20% Populus tremuloides (saplings); 1–5% Prunus virginiana; LOW SHRUB (open) 5–20% Prunus virginiana; <1% Rosa acicularis – Rubus idaeus subsp. melanolasius – Crataegus rotundifolia; HERB (semiclosed to closed) 50–75% Carex pensylvanica – Calamovilfa longifolia; 5–20% Stipa curtiseta – LITTER; 1–5% SOIL (sand) – **Asclepias ovalifolia** – Artemisia frigida – Juniperus horizontalis – Thermopsis rhombifolia – LICHEN – Rhus radicans var. rydbergii; <1% Poa sandbergii – Carex siccata – Mirabilis hirsuta – Opuntia fragilis – Solidago spathulata – Cerastium arvense – Koeleria macrantha – Equisetum variegatum – Muhlenbergia glomerata – Erysimum asperum – Artemisia ludoviciana – Lithospermum incisum – Chenopodium album – Chenopodium pratericola – Artemisia campestris subsp. caudata

map/date site: Ao13 – Asclova- 020715b

location: Wainwright Dunes Ecological Reserve; 3 km NNW of David Lake peninsula's southern tip; SE14-10-42-5W4; see map Ao13
lat./long.: (centre) 52°36.320'N / 110°38.565'W (0.025') (GPS)

collection: none

photos: F21 F22 (general habitat: sand hills upper slope shrubby grassland, pink flags mark plants)

plant numbers: 16 plants counted in 6 m X 24 m area in 4 concentrations: 7 plants (0.8 m

X 1.3 m), 4 (0.2 m X 0.8 m), 4 (0.3 m X 0.6 m), 1 (0.1 m X 0.1 m)

note: none

habitat: sand dune ridge upper slope (26° toward 210° – SW) and crest submesic sand with shrubby grassland of LOW SHRUB (open) 1–5% Prunus virginiana – Rosa acicularis – Populus tremuloides (saplings); HERB (semiclosed) 50–75% Stipa curtiseta; 5–20% SOIL (sand) – LITTER – Calamovilfa longifolia – Carex pensylvanica; 1–5% Koeleria macrantha – Selaginella densa; <1% Carex obtusata – Rhus radicans var. rydbergii – Juniperus horizontalis – Smilacina stellata – Comandra umbellata var. pallida – Chenopodium pratericola – Artemisia campestris subsp. caudata – Solidago missouriensis – Heterotheca villosa – **Asclepias ovalifolia**

map/date site: Ao14 – Asclova- 020716a

location: Wainwright Dunes Ecological Reserve; 2 km NNW of David Lake peninsula's southern tip; NE15–10–42–5W4; see map Ao14
lat./long.: (centre) 52°36.409'N / 110°38.235'W (0.025') (GPS)

collection: none

photo: none

plant numbers: 8 plants counted in 5 m X 12 m area

note: general vegetation survey only

habitat: sand dune ridge upper slope (variable angle and direction) and crest submesic sand with aspen forest fringe grassland of Calamovilfa longifolia – Stipa curtiseta – Bouteloua gracilis – Selaginella densa – Thermopsis rhomboidea – Carex obtusata – **Asclepias ovalifolia**

map/date site: Ao15 – Asclova- 020718d

location: Wainwright Dunes Ecological Reserve; 2.6 km NNE of David Lake peninsula's southern tip; NW6–14–42–5W4; see map Ao15
lat./long.: (centre) 52°36.928'N / 110°36.438'W (0.025') (GPS)

collection: 020718d1 (1 replicate @ ALTA / stem: full / leaf: mature / inflorescence: full / flower: dried, aborted)

photo: I18 (general habitat: kame moraine with young aspen grove)

plant numbers: 26 plants counted in 20 m X 30 m area in 8 clusters of 2 to 10 plants, generally under 0.3 square metres

note: marked by pink tape on aspen tree in centre of stand

habitat: sand dune ridge upper slope (3°–5° toward 105° – SSE) and crest subxeric to submesic sand with young semiopen grove of TALL SHRUB (semiopen to semiclosed) 5–20% Populus tremuloides; LOW SHRUB (semiclosed to open) 20–50% Prunus virginiana 5–20% Rosa acicularis – Symphoricarpos occidentalis; 1–5% Elaeagnus commutata; HERB (semiclosed) 20–50%

LITTER; 5–20% Carex pensylvanica var. digyna; 1–5% SOIL (sand) – Koeleria macrantha – Selaginella densa – Galium boreale – Stipa curtiseta; <1% Arctostaphylos uva-ursi – LICHEN– Smilacina stellata – **Asclepias ovalifolia**

map/date site: Ao16 – Asclova- 020720a

location: Wainwright Dunes Ecological Reserve; 2.4 km NW of David Lake peninsula's southern tip; SE6-10-42-5W4; see figure and map Ao16
lat./long.: (centre) 52°35.890'N / 110°38.537'W (0.025') (GPS)

collection: none

photo: K19 (habitat detail: dune ridge crest aspen grove fringe, pink flags indicate plant boundary)

plant numbers: 58 plants counted in 12 m X 30 m area in 14 small groups of 2 to 5 plants; withered flowers formed but not abscissing

note: marked by pink tape at SW end

habitat: sand dune ridge upper slope (10° toward 140° – SSE) and crest subxeric sand with open shrubby grassland of LOW SHRUB (very open) 1–5% Prunus virginiana – Populus tremuloides (saplings); HERB (semiclosed) 50–75% LITTER; 5–20% Agropyron trachycaulum subsp. subsecundum – Koeleria macrantha – Calamovilfa longifolia – Juniperus horizontalis; 1–5% SOIL (sand) – Selaginella densa – Poa ?sandbergii – Thermopsis rhomboidea – Smilacina stellata; <1% Galium boreale – Stipa curtiseta – Festuca saximontana – **Asclepias ovalifolia** – Solidago missouriensis – Gaillardia aristata – Campanula rotundifolia – Crepis runcinata – Heterotheca villosa – MOSS – Carex siccata – Arctostaphylos uva-ursi – Artemisia frigida – Equisetum variegatum – Erysimum asperum – Solidago nemoralis – Symphoricarpos occidentalis

map/date site: Ao17 – Asclova- 020720b

location: Wainwright Dunes Ecological Reserve; 2.4 km NW of David Lake peninsula's southern tip; SE6-10-42-5W4; see figure and map Ao17
lat./long: (centre) 52°35.919'N / 110°38.541'W (0.025') (GPS)

collection: none

photo: K20 (habitat detail: dune ridge crest aspen grove fringe, pink flags indicate plant boundary)

plant numbers: 4 plants counted in 1 m X 6 m area

note: about 80 m NW of 020720a

habitat: longitudinal sand dune ridge upper slope (3° toward 45° – NE) and crest submesic sand with aspen grove fringe grassland of TALL SHRUB (very open) 1–5% Populus tremuloides (saplings); LOW SHRUB (very open) 5–20% Populus tremuloides (saplings); 1–5% Prunus virginiana; HERB (semiclosed) 50-75% LITTER; 5-20% Carex siccata - Juniperus horizontalis - Thermopsis rhomboidea; 1-5% SOIL (sand) - Koeleria macrantha - Selaginella densa; <1% **Asclepias ovalifolia** - Agropyron trachycaulum subsp. subsecundum - Comandra umbellata var. pallida - Oryzopsis pungens - Galium boreale - Artemisia campestris subsp. caudata - Solidago missouriensis

map/date site: Ao18 - Asclova- 020720c
location: Wainwright Dunes Ecological Reserve; 2.4 km NW of David Lake peninsula's southern tip, approximately 45 m west of above population (020720b); SE6-10-42-5W4; see figure and map Ao18
lat./long.: (centre) 52°35.919'N / 110°38.579'W (0.025') (GPS)
collection: none
photos: J9 J10 (plant detail: wilted inflorescence and flowers) K21 (general habitat: sand land grassland, pink flags mark plant boundary)
plant numbers: 71 plants counted in 9 clusters in 8 m X 16 m area
note: located about 45 m W of 020720b
habitat: moderately rolling sandland slope (9° toward 180° - S) submesic sand with low grassland of LOW SHRUB (very open) <1% Populus tremuloides (seedling) - Prunus virginiana; HERB (semiclosed to closed) 50-75% Cladonia mitis; 5-20% Selaginella densa - Festuca saximontana - Bouteloua gracilis - LITTER; 1-5% LICHEN - Agropyron trachycaulum subsp. subsecundum - Koeleria macrantha - Stipa curtiseta - Equisetum variegatum; <1% SOIL (sand) - **Asclepias ovalifolia** - Juniperus horizontalis - Calamovilfa longifolia - Carex siccata - Artemisia ludoviciana - Cerastium arvense - Lithospermum incisum - Campanula rotundifolia

map/date site: Ao19 - Asclova- 020720d
location: Wainwright Dunes Ecological Reserve; 2.5 km NW of David Lake peninsula's southern tip; SW5-10-42-5W4; see figure and map Ao19
lat./long.: (centre) 52°35.948'N / 110°38.598'W (0.025') (GPS)
collection: 020720d1 (aspen grove / 1 replicate @ ALTA / stem: full / leaf: full / vegetative)
photos: K22 (general habitat: rolling sandland shrubby grassland, pink flags mark plant boundary) K23 (general habitat: rolling sandland aspen grove, pink flags mark plant boundary)
plant numbers: 186 plants counted in 10 m X 30 m area in two groups: 60 plants (5 m X 9 m, grassland) and 126 plants (5 m X 8 m, aspen grove); <10% with inflorescence
note: none

habitat 1: sand dune ridge upper slope (7° toward 200° - SSW) subxeric to submesic sand with shrubby grassland of LOW SHRUB (open) 1-5% Populus tremuloides (saplings) - Prunus virginiana; <1% Rosa acicularis; HERB (semiclosed to closed) 50-75% LITTER - Selaginella densa; 5-20% Calamovilfa longifolia - Koeleria macrantha - Festuca saximontana - Stipa curtiseta; 1-5% LICHEN - Juniperus horizontalis; <1% **Asclepias ovalifolia** - Poa sandbergii - Equisetum variegatum - Cladonia mitis - Chamaerhodos erectum - Artemisia frigida - Chenopodium pratericola

habitat 2: sand dune ridge base and rolling sandland slope (7° toward 200° - SSW) subxeric to submesic sand with open grove of LOW TREE & TALL SHRUB (very open to open) 5-20% Populus tremuloides; LOW SHRUB (open) 5-20% Prunus virginiana; 1-5% Populus tremuloides (saplings); HERB (semiclosed) 5-20% LITTER - Juniperus horizontalis; 1-5% Agropyron trachycaulum subsp. subsecundum - Smilacina stellata - Thermopsis rhombifolia - Comandra umbellata var. pallida; <1% SOIL (sand) - **Asclova** - Solidago missouriensis - Carex siccata - Cladonia mitis - Cerastium arvense - Equisetum arvense - Festuca saximontana - Campanula rotundifolia

Photos: Photographs of habitats and plant locations for *Asclepias ovalifolia* in the Wainwright Dunes Ecological Reserve

- Ao4—Asclova-020614e
  - A36 (general habitat: dune ridge grassland, looking SE)
  - A37 (habitat: sand ridge crest grove fringe)

- Ao7—Asclova-020714b
  - E21 (plant detail with flowering inflorescence)
  - E22 (plant detail with flowering inflorescence)
  - F14 (general habitat: dune ridge crest grassland, pink flags mark plants)
  - F15 (habitat detail: opening in dune ridge basin grove, pink flags mark plants)

- Ao8—Asclova-020714c
  - F16 (general habitat: dune ridge crest grassland along aspen grove fringe, looking SE)
  - Ao10—Asclova-020714e
  - F17 (general habitat: dune ridge crest grassland along aspen grove fringe, scale to backpack)
  - Ao13—Asclova-020715b
  - F21 (general habitat: sand hills upper slope shrubby grassland)
  - F22 (general habitat: sand hills upper slope shrubby grassland, pink flags mark

plants)

- Ao15—Asclova-020718d
  - I18 (general habitat: kame moraine with young aspen grove)
  - Ao16—Asclova-020720a
  - K19 (habitat detail: dune ridge crest aspen grove fringe, pink flags mark plant boundary)

- Ao17—Asclova-020720b
  - K20 (habitat detail: dune ridge crest aspen grove fringe, pink flags mark plant boundary)
  - Ao18—Asclova-020720c
  - J9 (plant detail: wilted inflorescence and flowers)
  - J10 (plant detail: wilted inflorescence and flowers)
  - K21 (general habitat: sand land grassland, pink flags mark plant boundary)

- Ao19—Asclova-020720d
  - K22 (general habitat: rolling sandland shrubby grassland, pink flags mark plant boundary)
  - K23 (general habitat: rolling sandland aspen grove, pink flags mark plant boundary)

Lycopus americanus Muhl. *ex* W.C. Barton—**American water-horehound—*LAMIACEAE***

This perennial, low herb species of marshy sites and moist stream sides has a provincial Rank of **S2** in Alberta, and a global Rank of **G5** (Vujnovic & Gould 2002, Kershaw *et al.* 2001, ANHIC 2002). It is an erect, deciduous plant with long rhizomes and stolons, growing in the ecological reserve to about 42 cm tall. It has opposite, deeply toothed, laciniate to pinnate, short hirsute leaves with distinct petioles. The inflorescence has very small, clusters of white, five-petalled flowers in each of the leaf axils, with narrowly triangular sepals that are over twice as long as wide at their base and are up to 2 mm long. The fruits are nutlets that are 1.0 - 1.4 mm wide X 0.7 - 1.0 mm long that form groups of four with a depressed center. This is one of the larger members of this genus in the province. It may be readily differentiated from the common *Lycopus asper* which has leaves that are merely toothed and are bluntly sessile, and has nutlets that are larger, mostly 1.6 - 2.1 mm wide X 1.4 - 1.8 mm long, and bears tubers at the stem base. As well, the common but smaller *Lycopus uniflorus* that has toothed leaves that taper to short petioles and are essentially glabrous, broadly triangular sepals which are less than twice as long as wide at their base and under 1 mm in length, and are shorter than the nutlets. Additionally, it may be distinguished from the more eastern *Lycopus virginicus* which has four petals, and from the European *Lycopus europaeus* which has longer and stiffer hairs on the lower leaf surface and anthers longer than 0.5 mm, neither of which have been reported in Alberta (Moss 1983, Gleason & Cronquist 1991, Scoggan 1979).

This species occurs across virtually all of North America south of the 60° latitude, with the exception of Nevada and Labrador, and is considered to be rare in Canada in the provinces of Alberta and Newfoundland, and in the United States in two southeastern states (NatureServe 2003, Kershaw *et al.* 2001,). Within the province it is known from 14 widely spaced known locations in the Grassland and Parkland Natural Regions, with at least one other station in the Wainwright area (ANHIC 2003). The biophysical studies of the Ecological Reserve and its immediate vicinity by Bradley & Bradley (1977), Fehr (1984) and Cottonwood Consultants, Ltd. (1986) presented the initial reports of the species occurrence here, with at least three locations, and the 2002 survey discovered an additional 17 locations, for a total of 20. Four of these sampled sites were located around the northern, western and southwestern backshores of the David Lake basin, five to the southeast of the Great Fen pond, three to the northeast of the Great Fen, two in the spring fen 600 m north of David Lake, and one just outside the eastern boundary of the Reserve, 2.5 north of the lake.

The total population of the species at the various locations within the Reserve is 887 individual plants, with and additional 15 being mere metres outside its eastern boundary. The previous records did not give accurate population sizes, except to indicate that they were "uncommon – here sparse". The populations occurred in areas from 1 m X 3 m to 10 m X 60 m, and in all probability they also extended around the northern shore of David Lake in a 100 m X 500 m area. The sampled numbers of individuals in the populations ranged from single plants to over 90 plants, and along the David Lake northern backshore there possibly are over 3 000 plants, based on 25 m X 25 m and 15 m X 30 m samples within the area. The phenology of the plants in the Reserve in 2002 had the leaves in young development stage by mid- to late June, and at least half developed by early July. The inflorescences were developing in the leaf axils by early to mid-July, and the flowers were appearing over a two month period between early- to late July and into mid- or late August. The nutlet development also was continuous between mid- to late July, to early to mid- to late August, and into early September.

Wallis' study of saline wetlands and springs (1990) described this as being an "obligate wetland species, very local in springs ...". The species occupied three different wetland and lowland habitats within the Reserve. Potentially the largest populations occupy the tall thicket communities of the backshore around David Lake. Along its northern backshore was a subhygric tall thicket of semiclosed *Betula occidentalis, Salix maccalliana, Salix planifolia, Salix pseudomonticola, Cornus stolonifera, Juncus balticus, Crepis runcinata, Solidago canadensis, Deschampsia cespitosa, Carex viridula, Carex aurea, Glyceria striata, Senecio pauperculus, Rubus pubescens* and others. Also associated with this habitat were several of the calcareous seepage species, such as *Parnassia palustris, Lobelia kalmii, Primula incana,* and the rare *Gentiana fremontii* and *Carex crawei*. It is in this extensive habitat that there is the potential for over 3,000 plants to occur. At the southwestern backshore of the lake the species occurred in much sparser numbers in a subhygric semiopen low thicket of *Salix lutea* (yellow willow), *Salix serissima* (autumn willow), *Salix candida* (hoary willow), *Calamagrostis stricta, Carex aurea, Juncus balticus, Solidago canadensis* and several of the calcareous seepage species, including the rare *Gentiana fremontii.* Additionally,a modest number of plants of the species was supported in a tall thicket habitat that formed a fringe around a wetland basin 600 m to the north of David Lake, that also was dominated by *Betula occidentalis, Salix pseudomonticola, Salix sericea* and *Carex aquatilis,* with many swamp forest species. Fehr's community sample 043 probably was this same community, but his survey captured it in a non-drought situation, with standing water and a greater variety of marshland sedges, such as *Carex aquatilis, Carex lasiocarpa* (probably actually Carex lanuginosa) and *Carex utriculata* being evident. This thicket community also occurred along the lake's northern side, but to the east of the Reserve boundary, no plants of this species were located there. A variation of this thicket community occurring in a subhygric basin in the sand plain which was well-removed from the lake's northern backshore, did support a small population. Fehr (1984) also described a second habitat complex for this species as an open shrubby marsh on the western side of David Lake, also with high water in evidence. His community sample 045 described the species from very scattered *Salix* (species) and *Salix candida* in a graminoid marsh of *Carex aquatilis, Carex lasiocarpa* (?), *Carex utriculata, Carex sartwellii* (Sartwell's sedge), *Calamagrostis inexpansa, Scirpus acutus* (great bulrush), *Juncus balticus* and others. The third major habitat complex in the Reserve was associated with the beaver dams and shorelines of the drawndown beaver ponds, such as those at the southeastern and to the northeast ends of the Great Fen. The dams had a subhygric, sandy and organic substrate and supported an essentially mixed graminoid marsh fringe community of *Scirpus microcarpus* var. *rubrotinctus* (small-fruited bulrush), *Calamagrostis canadensis, Carex aquatilis, Carex utriculata, Mentha arvensis* (wild mint), *Lysimachia thyrsiflora* (tufted loosestrife), *Eleocharis palustris, Lysimachia ciliata, Sonchus uliginosus, Rumex occidentalis* (western dock), *Glyceria striata, Potentilla norvegica* (rough cinquefoil) and others. These dams appear to have been used as wildlife trails for crossing the ponds, and some degree of disturbance from the trampling may have created successional conditions here. Also associated with the pond drawdown and supporting plants of this species were shoreline marsh meadows of *Calamagrostis canadensis, Glyceria grandis, Poa palustris* (fowl blue grass), *Carex utriculata, Eleocharis palustris, Juncus nodosus, Alopecuris aequalis* (short-awned foxtail), *Juncus balticus, Catabrosa aquatica* (brook grass) and others. The final habitat that the species was discovered in was an active calcareous seepage slope with a shrubby graminoid fen, 600 m to the north of David Lake, where the plants grew at the base of the shrubs. This hygric site with flowing water had scattered *Betula occidentalis* over a marsh meadow of *Carex utriculata, Carex viridula, Carex aurea, Eleocharis quinqueflora, Solidago canadensis, Gentiana crinita* and several of the typical fen species.

Habitat threats in the Reserve for this species were related to the prolonged drought conditions, in particular as they affected the water levels of the pond, stream and lake shoreline habitats. The effect may be variable in the case of the stream and pond banks, where there still may have been sufficient moisture in the soil to allow the species and associated shoreline communities to expand into the wetland basin, as was the case in the stream / pond system to the northeast of the Great Fen. However, on the other hand, the drawdown conditions in other instances have not produced suitable habitat, at least at this time, as is the case in the large pond to the southeast of the Great Fen. Additionally, the use of the beaver dams as game trails may have lead to inadvertent trampling as well as incidental browsing of the plants, as was observed at one site.

Management considerations for this species should include monitoring the known populations and searching elsewhere around the periphery of the David Lake basin and the Great Fen and the other wetland shrubby marsh and thicket communities in the Ecological Reserve. The impact of prolonged drought conditions on the beaver populations also should be examined, since the loss of the beaver dams and associated activities may change the abundance of suitable habitat for this and several other rare vascular plant species, such as the reported *Najas flexilis, Elodea biflora* and *Ruppia cirrhosa.*

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Lycopus americanus* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	frost (4)
Flood Hazard	not apply
Soil Drainage	imperfectly drained (5), poodly drained (6)
Perviousness	moderately (2)
Site: Macro	not apply
Site: Meso	depression (6), level (7)
Site: Micro	irregular (5), straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	hygric (7), subhygric (5), subhydric (8)
Nutrients	?mesotrophic (3)
Successional Status: 1	young seral (2)
Successional Status: 2	not apply
Disturbance Factors	water (8)

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	mid- to late June to early July
Phenology: reproductive – inflorescence	early to mid-July
Phenology: reproductive – flower	early to mid- to late July, to mid- to late August
Phenology: reproductive – fruit	mid- to late July, to early to mid to late August to early September
Habitat Threats	drought drawdown of pond / stream / lake; game trails
Management Considerations	monitoring populations; drought impact on beaver populations

Species location summary for *Lycopus americanus* in the Wainwright Dunes Ecological Reserve

map site / date site	location coordinates	number (size)	habitat
La1 - Lycoame-77xxxxa	no information	no information	no information
La2 - Lycoame-8307xxa	UTM27 525500E 5826000N	uncommon, sparse	bay of David Lake

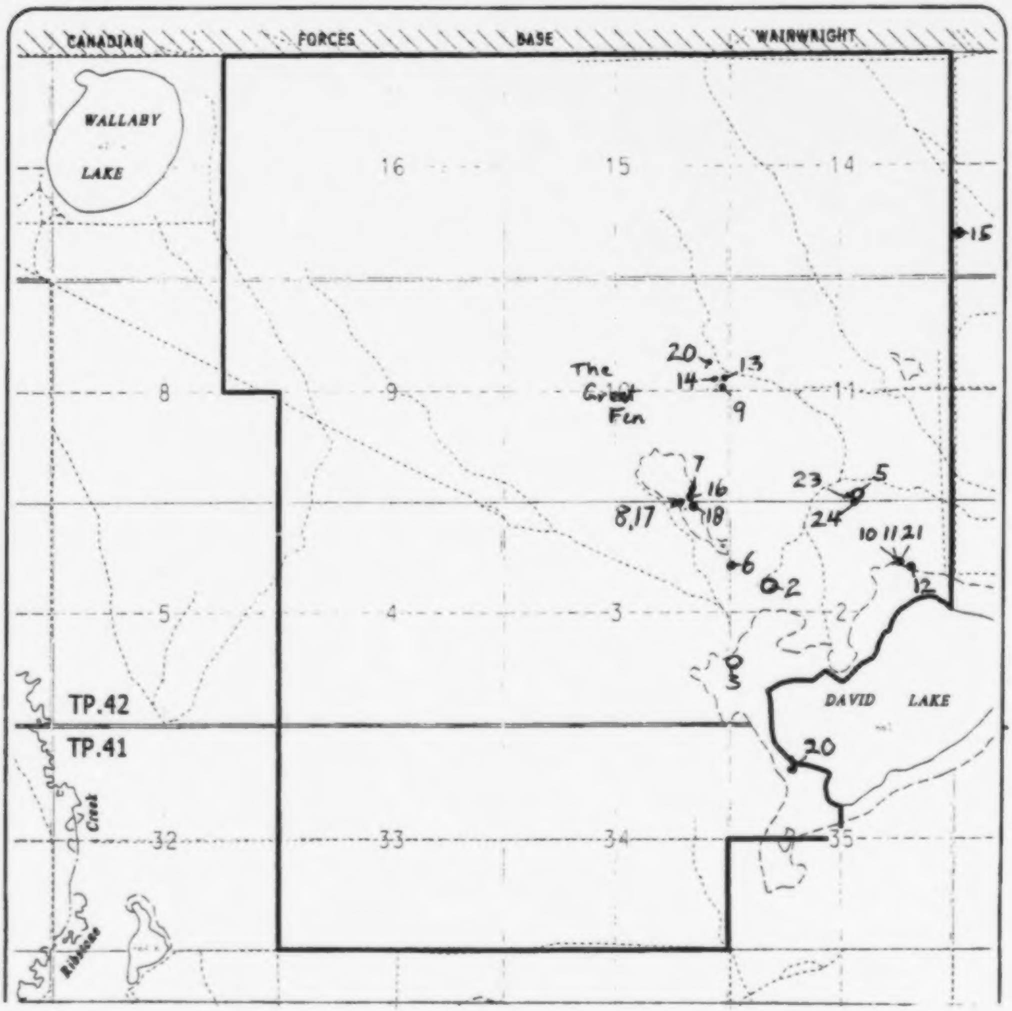
map site / date site	location coordinates	number (size)	habitat
La3 – Lycoame-8307xxb	UTM27 525400E 5825700N	no information	sandplain depression graminoid fen
La4 – Lycoame-84xxxxa	no information	uncommon	wet areas
La5 – Lycoame-86xxxxa	52°35.700'N 110°36.820W	no information	calcareous seepage tall thicket fen
La6 – Lycoame-020613f	52°35'19.7"N 110°37'40.3"W	20 (2 m X 4m)	drawdown beaver pond shore
La7 – Lycoame-020615f	52°35.676'N 110°37.929'W	25 (1 m X 3 m)	drawdown beaver pond dam
La8 – Lycoame-020615l	52°35.638'N 110°37.974'W	74 (1 m X 8 m)	drawdown beaver pond dam and shore
La9 – Lycoame-020616a	52°36.104'N 110°37.686'W	14 (1m X 8 m)	drawdown beaver pond dam
La10 – Lycoame-020712a	52°35.380'N 110°36.525'W	90 (25m X 25m)	drawdown lake backshore tall thicket
La11 – Lycoame-020712b	52°35.405'N 110°36.519'W	69 (25m X 25m)	drawdown lake backshore tall thicket
La12 – Lycoame-020712d	52°35.378'N 110°36.469'W	43 (10mX10m)	lake backshore seepage tall thicket
La13 – Lycoame-020714a	52°36.138'N 110°37.674'W	634 (25 X 50)	beaver pond dam & drawdown pond shore
La14 – Lycoame-020715e	52°36.168'N 110°37.761'W	1 (1m X 1m)	drawdown beaver pond dam
+La15 – Lycoame-020718b	52°36.670'N 110°36.244'W	15 (2m X3 m)	basin tall thicket swamp
LLa16 – Lycoame-020719c	52°35.660'N 110°37.972'W	65 (1m X 3.5m)	drawdown beaver pond dam
La17 – Lycoame-	52°35.639'N 110°38.038'W	184 (1m X 30m)	drawdown beaver pond dam

map site / date site	location coordinates	number (size)	habitat
020719d			
La18 - Lycoame-020719e	52°35.628'N 110°38.010'W	36 (1m X 95 m)	drawdown beaver pond dam
La19 - Lycoame-020719j	52°35.507'N 110°37.870'W	8 (0.4m X 1.5 m)	drawdown beaver pond shore
La20 - Lycoame-020721a	52°36.141'N 110°37.748'W	>150 (5m X 5m)	drawdown stream channel beaver dam
La21 - Lycoame-020815f	52°35.412'N 110°36.508'W	70 (15m X 40m)	drawdown lake backshore fen tall thicket
La22 - Lycoame-020818e	52°34.617'N 110°37.248'W	5 (10m X 30m)	lake backshore fen open thicket
La23 - Lycoame-020819a	52°35.692'N 110°36.817'W	93 (10m X 60m)	slope seepage fen thicket fringe
La24 - Lycoame-020819b	52°35.684'N 110°36.798'W	12 (1m X 3m)	slope seepage fen open thicket

Note: that La9 and La 8 are early summer surveys, and La13 and La17 are mid-summer surveys of the same locations, respectively.

Photo: *Lycopus americanus* (American water-horehound) detail of plant growth habit (La17—Lycoame-020719d-J2, photo Ian D. Macdonald)

Map: Species locations for *Lycopus americanus* in the Wainwright Dunes Ecological Reserve (o indicates approximate reported locations)


CANADIAN FORCES BASE WAINWRIGHT
WALLABY LAKE
16
15
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8
9
The Great Fen
10
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9
7
16
8,17
18
23
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24
10 11 21
6
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12
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4
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2
3
TP.42
TP.41
DAVID LAKE
20
32
33
34
35
Ribstone Creek

PREVIOUSLY REPORTED SPECIES LOCATIONS

map/date site: La1 – Lycoame-77xxxxa
location: Wainwright Dunes Ecological Reserve and vicinity // not mapped
source: Bradley, L. and C. Bradley. 1977. Aspen Grove resource assessment: Wainwright area. Parks Planning and Design Branch, Alberta Recreation, Parks and Wildlife, Edmonton.
reference: Fehr, A. 1984. Wainwright Study Area: Biophysical Inventory. Natural Areas Program, Public Lands Division, Alberta Energy and Natural Resources, Technical Report No. t/65, Edmonton.
observation: L. & C. Bradley 1977
collection: no information
photo: none
plant numbers: no information
note: this report cited in Fehr 1984
habitat: no information

map/date site: La2 – Lycoame-8307xxa
location: Wainwright Dunes Ecological Reserve // bay at NW side of David Lake, 0.8 km NW of peninsula's southern tip // UTM27 525500E 5826000N (see below) // S precision // see map La2
source: ANHIC // Element Occurrence // PDLAM0X010 # 001
reference: Fehr, A. 1984. Wainwright Study Area: A Biophysical Inventory. Alberta Energy and Natural Resources. document source code R84FEH01ABCA
observation: Fehr, A. // 1983-05-xx 1983-07-xx // veg plot AF83043
collection: none
photo: no information
plant numbers: no information
note: none
habitat: no community information in ANHIC data // elev. 662 m
comment: species not rediscovered at this location during 2002 survey; possibly overlooked due to early season survey; see Carex Parryana 020614b; interpretation of Fehr 1984 vegetation plot data for Study Area ID 043
location is within the Wainwright Dunes Ecological Reserve; ca 800 m NW of the peninsula's southern tip; UTM27 525500 5826380 (50 m) (map); NE12-2-42-5W4
population is "uncommon – here sparse"
habitat is bay of David Lake site with hygric organic shrubby graminoid marsh of LOW SHRUB (extremely open) Salix petiolaris; HERB (very closed) WATER (40%) – Calamagrostis inexpansa (20%) – Potentilla anserina

(20%) – Carex (species) (15%) – Glyceria borealis (5%) – Juncus balticus (5%) – Mentha arvensis (5%) – MOSS (5%) – Aster borealis (3%) – Deschampsia cespitosa (2%) – Hordeum jubatum (2%) – **Lycopus americanus** (2%) – Polygonum amphibium (2%) – SOIL (organic) (1%) – Agropyron (species) (0.5%) – Lycopus asper (0.5%) – Ribes oxyacanthoides (0.5%) – LITTER (0.5%) – Senecio ?lugens (0.1%)

map/date site: **La3 – Lycoame-8307xxb**
location: Wainwright Dunes Ecological Reserve // NW side of David Lake, wet depression on sand plain 0.5 km NW of peninsula // UTM27 525400E 5825700N (see below) // S precision // see map La3
source: ANHIC // Element Occurrence // PDLAM0X010 # 001
reference: Fehr, A. 1984. Wainwright Study Area: A Biophysical Inventory. Alberta Energy and Natural Resources. Source Code: R84FEH01ABCA
observation: Fehr, A. // 1983-07-xx // veg plot AF83045
collection: none
photo: none
plant numbers: no information
note: Fehr's general plant list indicated that L. Bradley & C. Bradley also recorded the species in 1977
habitat: no information in ANHIC data
comment: species not rediscovered at this location during 2002 survey; interpretation of Fehr 1984 vegetation plot data for Study Area ID 045
location is within the Wainwright Dunes Ecological Reserve; ca 700 m W of the peninsula's southern tip; UTM27 525280 5825800 (50 m) (map); NE4-2-42-5W4;
population is "uncommon – here very sparse"
habitat is backshore sandplain hygric organic depression with graminoid marshy fen of LOW SHRUB (extremely open) Salix (species) (4%) – Salix candida (1%); HERB (very closed) Carex aquatilis (25%) – Carex ?lasiocarpa *sensu lato* (20%) – Carex ?utriculata (originally C. rostrata) (20%) – Carex sartwellii (15%) – WATER (15%) – Calamagrostis inexpansa (10%) – Scirpus acutus (5%) – Mentha arvensis (4%) – Hordeum jubatum (3%) – Juncus balticus (3%) – Poa palustris (3%) – SOIL (organic) (3%) – LITTER (2%) – Polygonum amphibium (1%) – **Lycopus americanus** (0.5%) – Lycopus asper (0.5%) – Potentilla norvegica (0.5%) – Stellaria longipes (0.1%)

map/date site: La4 - Lycoame-84xxxxa

location: Wainwright Dunes Ecological Reserve; no accurate location; not mapped
source: Fehr 1984
reference: Fehr, A. 1984. Wainwright Study Area: Biophysical Inventory. Natural Areas Program, Public Lands Division, Alberta Energy and Natural Resources, Technical Report No. t/65, Edmonton. Source Code: R84FEH01ABCA
observation: A. Fehr 1983 (as indicated in species list of his Appendix 5)
collection: no information
photo: no information
plant numbers: uncommon
note: none
habitat: "wet areas"

map/date site: La5 - Lycoame-86xxxxa

location: Wainwright Dunes Ecological Reserve; 600 m north of David Lake central north shore, 1200 m NNE of David Lake peninsula's southern tip; SE2-11-42-5W4; see map La5
lat./long.: (vicinity) 52°35.700'N / 110°36.820W (0.025') (map)
source: —
reference: Cottonwood Consultants, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton.
observation: C. Wallis 1986
collection: no information; none in Alberta Parks herbarium (PP)
photo: none
plant numbers: no information
note: this is the general location for Lycopus americanus 020819a and 020819b (La21 La22)
habitat: no information given, but this is a calcareous seepage basin tall thicket fen of Betula occidentalis - Salix pseudomonticola - Salix sericea - Cornus stolonifera - Carex aquatilis - Carex utriculata

RECENTLY DISCOVERED SPECIES LOCATIONS

map/date site: La6 - Lycoame-020613f

location: Wainwright Dunes Ecological Reserve; 1.1 km NW of David Lake peninsula's southern tip, south side of old beaver lodge just east of

water channel; NW12-2-42-5W4; see map La6
lat./long.: (centre) 52°35'19.7"N / 110°37'40.3"W (0.025') (GPS)

collection: 020613a14 (1 replicate @ ALTA / very young plants / root / rhizome / stem: 3 - 5 cm / leaves: young, 1/3 to 2/3 expanded / no inflorescence)

photo: none

plant numbers: 20 very young plants counted in 2 m X 4 m area

note: none

habitat: recently downdrained beaver pond with subhygric sandy silt with early season forb marsh of Urtica dioica var. gracilis - Carex utriculata - Sonchus uliginosus - Viola nephrophylla - Mentha arvensis - Typha latifolia - Calamagrostis canadensis - Stellaria longifolia - Sium suave - Rorippa ?palustris - **Lycopus americanus** - Ranunculus gmelinii var. gmelinii

map/date site: La7 - Lycoame-020615f

location: Wainwright Dunes Ecological Reserve; 1.5 km NW of David Lake peninsula's southern tip; 8 m from the northeastern end of old beaver dam; SW1-10-42-5W4; see map La7
lat./long.: (centre) 52°35.676'N / 110°39.929'W (0.025') (GPS)

collection: 020615a9 (1 replicate @ ALTA / young plant / old 2001 stem: 5 - 8 cm / leaf: 90% expanded / inflorescence remnants with old fruit)

photo: B11 (general habitat: drawdown beaver pond and dam)

plant numbers: 25 young plants counted in 1 m X 3 m area; all young plants at the rosette stage with no inflorescences

note: none

habitat: on old beaver dam of downdrained beaver pond; this is the westernmost, first dam of the pond complex with closed subhygric forb marsh fringe of 50-75% Calamagrostis canadensis; 5-20% Carex utriculata; <1% Glyceria striata - Viola nephrophylla - Mentha arvensis - Stellaria longifolia - Carex diandra - **Lycopus americanus** - Carex lanuginosa - Equisetum fluviatile - Lysimachia thyrsiflora - Eleocharis palustris - Potentilla anserina - Hippurus vulgaris - Aster ?hesperius (early summer survey)

map/date site: La8 - Lycoame-020615l

location: Wainwright Dunes Ecological Reserve; 1.5 km NW of David Lake peninsula's southern tip, 6 m from western end of beaver dam; SE1-10-42-5W4; see map La8
lat./long.: (centre) 52°35.638'N / 110°37.974'W (0.025') (GPS)

collection: none

photo: B13 (habitat detail: west end of beaver dam, seedlings on sandy substrate)
plant numbers: 74 young plants counted in two groups: 6 m from western end of dam has 16 young plants in 0.5 m X 0.8 m area, and at western end of dam has 58 young plants in 3 m X 4 m area; none yet with inflorescence development
note: associated with disturbed game trail across dam crest and at bank edge; see mid-summer resurvey (020719d - La17)
habitat 1: beaver dam of downdrained pond with closed subhygric sand forb marsh fringe of 20-50% Lycopus asper; 5-20% Urtica dioica var. gracilis; 1-5% Carex lanuginosa - Eleocharis palustris - Cornus stolonifera - **Lycopus americanus**; <1% Cerastium vulgatum - Solidago gigantea - Potentilla norvegica - Rorippa palustris - Geum ?aleppicum
habitat 2: beaver dam of downdrained pond at sandy bank slope with closed subhygric sand forb marsh fringe of Scirpus microcarpus var. rubrotinctus - Galium boreale - **Lycopus americanus** - Smilacina stellata - Urtica dioica var. gracilis - Equisetum arvense - Sonchus uliginosus - Aster ciliolatus - Anemone canadensis - Rosa acicularis (general survey only)

map/date site: La9 - Lycoame-020616a
location: Wainwright Dunes Ecological Reserve; 12.3 km NNW of David Lake peninsula's southern tip, eastern end of old beaver dam of small, narrow pond; SE9-10-42-5W4; see map La9
lat./long.: (centre) 52°36.104'N / 110°37.686'W (0.025') (GPS)
collection: none
photo: B15 (general habitat: beaver dam crest)
plant numbers: 14 young plants counted in 1 m X 8 m area, none yet with inflorescence development
note: see also mid-summer resurvey (020714a - La13)
habitat: drawdown beaver pond dam supporting subhygric graminoid marsh fringe of 50-75% Calamagrostis canadensis; 20-50% Carex aquatilis - Lycopus asper; 5-20% Juncus balticus; 1-5% Scirpus microcarpus var. rubrotinctus - Polygonum lapathifolium; <1% Potentilla norvegica - Lysimachia thyrsiflora - Mentha arvensis - **Lycopus americanus** - Urtica dioica var. gracilis - Cornus stolonifera - Plantago major - Juncus tenuis var. dudleyi - Alisma plantago-aquatica - Eleocharis palustris - Taraxacum officinale - Stellaria longifolia - Sonchus uliginosus - Carex Š Ovales (?bebbii)- Carex ?sartwellii

map/date site: La10 – Lycoame-020712a

location: Wainwright Dunes Ecological Reserve; north shore of David Lake, 800 m NE of David Lake peninsula's southern tip; 36 m @ 0° from edge of thicket / lake marsh border, marked by pink ribbon on willow ; NW9-2-42-5W4; see figure map La10
lat./long.: (centre) 52°35.360'N / 110°36.525'W (0.025') (GPS)

collection: 020712a1 (2 replicates @ PP# 4872 UAC / yong plants / root / rhizome / stem: 5 - 21 cm / leaf: 70% - 90% expanded / flower buds: young, 5%)

photo: F7 (general habitat: backshore tall thicket of Salix maccalliana)

plant numbers: 90 plants counted in six clusters in 25 m X 25 m sampled area , probably more; 20% with developing inflorescences

note: Gentiana fremontii also recorded from general vicinity (020815f); habitat has many elements of the rich calciphilous habitat to the east of the reserve boundary (020710e, 020711a); slight seepage from balsam poplar mid-aged forest to north; terrain essentially flat with slight hummock development in shrub coppice bases; somewhat mesic now but probably hygric at higher lake levels

habitat: drawdown lake backshore subhygric seepage tall thicket (slope 1° toward 180° – S) of TALL SHRUB (semiclosed height 3.5 m) 50–75% Salix maccalliana; 5–20% Betula occidentalis; <1% Salix petiolaris – Populus balsamifera (saplings); LOW SHRUB (semiopen) 20–50% Salix maccalliana; 5–20% Salix pseudomonticola; 1–5% Salix petiolaris – Salix candida; <1% Cornus stolonifera – Salix planifolia – Symphoricarpos occidentalis – Rosa acicularis; HERB (semiclosed to closed); 20–50% Carex lanuginosa – LITTER; 5–20% Juncus balticus; 1–5% Solidago canadensis – Eleocharis palustris – Carex viridula – Carex aurea; <1% Juncus nodosus – Senecio pauperculus – Sonchus uliginosus – Potentilla anserina – Carex sartwellii – Rubus pubescens – Viola nephrophylla – Deschampsia cespitosa – **Lycopus americanus** – Triglochin palustris – Carex capillaris subsp. chlorostachys – Pyrola asarifolia – Primula incana – Platanthera hyperborea – Amelanchier alnifolia (seedlings) – Lilium philadelphicum – Juncus alpinoarticulatus – Epilobium ?leptophyllum – Glyceria striata – Lobelia kalmii – Mentha arvensis

map/date site: La11 – Lycoame-020712b

location: Wainwright Dunes Ecological Reserve; north shore of David Lake, 800 m NE of David Lake peninsula's southern tip, NW9-2-42-5W4; see map La11
lat./long.: (centre) 52°35.405'N / 110°36.519'W (0.025') (GPS)

collection: none

photo: F6 (general habitat: backshore tall thicket of Betula occidentalis)

plant numbers: 69 plants counted in 7 clusters in 25 m X 25 m sampled area, probably more; 20% with developing inflorescences

note: Gentiana fremontii also recorded from general vicinity (020815f); habitat has many elements of the rich habitat to the east of the reserve boundary (020710e, 020711a);

habitat: drawdown lake backshore with slight seepage from balsam poplar mid-aged forest to north; terrain essentially flat with slight hummock development in shrub coppice bases; essentially mesic now but probably hygric at higher lake levels; supporting subhygric seepage tall thicket of TALL SHRUB (semiclosed to closed) 50-75% Betula occidentalis; 1-5% Populus tremuloides (saplings); LOW SHRUB (semiopen to open) 5-20% Salix maccalliana - Rosa acicularis; 1-5% Salix pseudomonticola - Symphoricarpos occidentalis - Shepherdia canadensis; <1% Populus balsamifera (saplings); HERB (closed to semiclosed) 20-50% LITTER; 5-20% Crepis runcinata; 1-5% Juncus balticus - Sonchus uliginosus - Solidago canadensis; <1% Glyceria striata - Carex capillaris subsp. chlorostachys - Taraxacum officinale - Pyrola asarifolia - Juniperus communis - Rubus pubescens - Deschampsia cespitosa - Galium triflorum - Poa pratensis - Senecio pauperculus - Antennaria parvifolia - **Lycopus americanus** - Lilium philadelphicum - Smilacina stellata - Zizia aptera - Sisyrinchium montanum - Muhlenbergia glomerata - Gentiana crinita

map/date site: La12 - Lycoame-020712d

location: Wainwright Dunes Ecological Reserve; north shore of David Lake, 800 m NE of David Lake peninsula's southern tip backshore tall thicket on north backshore of David Lake, about 200 m @ 290° from east boundary gate; NW9-2-42-5W4; see figure and map La12
lat./long.: (centre) 52°35.378'N / 110°36.467'W (0.025') (GPS)

collection: 020712d1 (1 replicate @ ALTA / young plants / root / rhizome / stem: 10 cm / leaf: 80% open and expanded / flower buds: very young)

photo: none

plant numbers: 43 plants counted in eight clusters in 10 m X 10 m sampled area, and probably more in vicinity; 85% with mature inflorescences at young flowering to mid-fruiting stages

note: this is a tall thicket fringe between the lake shore marsh and the backshore balsam poplar forest

habitat: drawdown lake backshore subhygric seepage tall thicket of TALL SHRUB (semiclosed) 50-75% Betula occidentalis; 5-20% Salix maccalliana; 1-5% Salix planifolia; LOW SHRUB (semiopen) 20-50% Betula occidentalis; 1-5%

Salix pseudomonticola; <1% Symphoricarpos occidentalis; HERB (semiclosed to closed) 5-20% Juncus balticus - Crepis runcinata; 1-5% Solidago canadensis var. canadensis; <1% Glyceria striata - Deschampsia cespitosa - Senecio pauperculus - Carex capillaris subsp. chlorostachys - Rubus pubescens - **Lycopus americanus** - Pyrola asarifolia - Schizachne purpurescens - Sisyrinchium montanum - Galium triflorum - Lobelia kalmii - Viola nephrophylla - Smilacina stellata - Urtica dioica var. gracilis - Mentha arvensis - Lycopus asper - Thalictrum venulosum - Potentilla anserina

map/date site: La13 - Lycoame-020714a

location: Wainwright Dunes Ecological Reserve; 2 km NW of southern tip at David Lake peninsula; beaver dam at SE end of the Great Fen; SE9-10-42-5W4; see figure and map La13
lat./long.: (centre) 52°36.138'N / 110°37.374'W (0.025') (GPS)

collections: 020714a1 (2 replicates @ ALTA UAC / mature plants / root / rhizome / stem: 45 cm / flower buds: 10% / submature flower: 20% / mature flower: 60% / old flower: 10%) 020714a4 (1 replicate @ ALTA / young to submature plants / root / rhizome / stem: 6 - 28 cm / leaf / flower buds / submature flower: 50% / mature flower: 15%)

photos: E17 E18 (detail of plant: portrait, mid-flowering) E19 E20 (detail of population: plant cluster) F11 (habitat 1 at SE end of dam, pink flags mark plant locations) F12 (habitat 1 in central portion of dam, plant among tall graminoids, pink flags mark plant locations) F13 (habitat 2, habitat detail: in drawdown pond shore and basin, plants among Juncus nodosus, Calamagrostis canadensis, Glyceria grandis)

plant numbers: 634 plants counted in two groups: 1) along dam there are 386 plants in 40 clusters in 1 m X 25 m area, and 2) on pond bank there are 235 plants in 8 clusters in 4 m X 35 m area; 80% with mature inflorescences early flowering to mid-fruiting stages

note: this is a mid-summer resurvey of the early summer condition (see 020616a - La8); beaver pond to north with aquatics of Utricularia vulgaris - Ceratophyllum demersum - Sagittaria cuneata - Glyceria grandis - Calla palustris - Lemna minor - Bidens cernua - Carex diandra - Juncus nodosus; to south is extensive tall thicket of Salix petiolaris - Salix pseudomonticola - Corylus cornuta

habitat 1: drawdown beaver pond dam with subhygric sandy organic marsh fringe forb meadow of 5-20% Scirpus microcarpus var. rubrotinctus - SOIL (sandy organics) - Calamagrostis canadensis - Carex aquatilis - Carex urticifolia; 1-5% LITTER - Poa palustris - Solidago canadensis var.

	canadensis – Scutellaria galericulata – Mentha arvensis – Lycopus asper – Lysimachia thyrsiflora; <1% Equisetum arvense – **Lycopus americanus** – Eleocharis palustris – Plantago major – Urtica dioica var. gracilis – Vicia americana – Equisetum fluviatile – Lysimachia ciliata – Stachys palustris – Potentilla norvegica – Juncus tenuis var. dudleyi – Alopecuris aequalis – Galium trifidum – Cicuta bulbifera – Ribes americana – Carex bebbii – Glyceria striata – Polygonum lapathifolium – Geum macrophyllum var. perincisum – Chenopodium album – Agrostis stolonifera var. palustris – Salix bebbiana (seedling) – Cerastium vulgatum – Sphenopholis intermedia – Stellaria longipes – Bromus ciliatus – Cornus stolonifera (seedling) – Sonchus uliginosus – Spiraea alba – Hierochloe odorata – Aster hesperus – Betula occidentalis (seedling) – Rumex occidentalis – Cirsium arvense – Platanthera hyperborea – Stellaria longifolia – Rubus pubescens – Anemone canadensis – Crepis tectorum
habitat 2:	drawdown beaver pond shore of subhygric to mesic sandy organic muck marsh fringe graminoid meadow of 5–20% SOIL (sand) – Calamagrostis canadensis – Glyceria grandis; 1–5% Poa palustris – Carex utriculata – Eleocharis palustris; <1% Equisetum fluviatile – **Lycopus americanus** – Lycopus asper – Juncus nodosus – Potentilla norvegica – Scutellaria galericulata – Carex bebbii – Alopecuris aequalis – Galium trifidum – Eleocharis acicularis – Rumex occidentalis – Juncus balticus – Stellaria longifolia – Achillea millefolium – Catabrosa aquatica – Salix bebbiana (seedling) – Taraxacum officinale – Cryptantha fendlerii
map/date site:	**La14 – Lycoame-020715e**
location:	Wainwright Dunes Ecological Reserve; 2.1 km NNW of David Lake peninsula's southern tip; SE9-10-2-42-5W4; see map La14 lat./long.: (centre) 52°36.168'N / 110°37.761'W (0.025') (GPS)
collection:	none
photo:	none
plant numbers:	1 plant counted in 1 m X 1 m area, in mature inflorescence
note:	this is the wetland upstream from Lycopus americanus occurrence 020714a; moose trail across this dam crest
habitat:	drawdown beaver pond dam with subhygric sandy organic marsh fringe mixed meadow of 20–50% SOIL (sandy organics); 5–20% Mentha arvensis – Alopecuris aequalis – Galium trifidum; 1–5% Poa palustris – Juncus bufonius; <1% Plantago major – Cicuta bulbifera – Stellaria longipes – Potentilla norvegica – Scutellaria galericulata – Lycopus asper – Scirpus microcarpus var. rubrotinctus – **Lycopus americanus –** Carex utriculata – Equisetum arvense – Collinsonia linearis – Achillea millefolium

- Sphenopholis intermedia - Veronica peregrina var. xalapensis - Glyceria borealis - Thlaspi arvense - Lysimachia thyrsiflora - Geum macrophyllum var. perincisum - Cerastium vulgatum

map/date site: **La15 - Lycoame-020718b**
location: adjacent to eastern boundary of Wainwright Dunes Ecological Reserve; 2.5 km north of David Lake north shore; SE1-14-42-5W4; see figure and map La15
lat./long.: (centre) 52°36.670'N / 110°36.244'W (0.025') (GPS)
collection: 020718b1 (1 replicate @ ALTA / root / rhizome / stem: 8 - 10 cm / leaf / flower buds / young flower / mature flower: 10%)
photo: none
plant numbers: 15 plants counted in 2 m X 3 m area
note: none
habitat: sandland interridge basin with subhygric tall thicket swamp of TALL SHRUB (semiclosed to semiopen) 20-50% Salix petiolaris; 1-5% Salix lutea; <1% Populus balsamifera (sapling) - Salix pseudomonticola - Betula occidentalis - Salix sericea; LOW SHRUB (semiopen) 5-20% Symphoricarpos occidentalis - Rosa woodsii; 1-5% Rubus idaeus; <1% Populus balsamifera (seedling); HERB (closed to semiclosed) 20-50% LITTER; 5-20% Glyceria striata - Poa pratensis; 1-5% Juncus balticus; <1% Thalictrum venulosum - Fragaria virginiana - Solidago canadensis - **Lycopus americanus** - Cirsium flodmanii - Pyrola asarifolia - Scutellaria galericulata - Antennaria parvifolia - Potentilla norvegica - Senecio paupercula - Schizachne purpurascens - Taraxacum officinale - Potentilla anserina - Poa interior - Aster hesperius

map/date site: **La16 - Lycoame-020719c**
location: Wainwright Dunes Ecological Reserve; drawdown beaver pond at SE end of the Great Fen, NE end of fronting beaver dam; 1-10-42-5W4; see figure and map La16
lat./long.: (centre) 52°35.660'N / 110°37.972'W (0.025') (GPS)
collection: none
photo: K5 (general habitat: old beaver dam, pink flags mark plant locations)
plant numbers: 65 plants counted in 1 m X 3.5 m area; 20% with mature inflorescence having young flowers to submature fruits
note: none
habitat: drawdown beaver pond dam with subhygric to hygric sandy organics and logs with marsh fringe mixed meadow of 20-50% Carex utriculata; 5-20% LITTER - Carex aquatilis; 1-5% Lycopus asper; <1% **Lycopus**

americanus – Glyceria striata – Poa palustris – Chenopodium rubrum – Potentilla anserina – Scutellaria galericulata – Mentha arvensis – Crepis tectorum – Populus tremuloides (seedling) – Chenopodium salinum – Salix petiolaris (seedling) – Rumex maritimus

map/date site: **La17 – Lycoame-020719d**

location: Wainwright Dunes Ecological Reserve; drawdown beaver pond at SE end of the Great Fen, this site includes the basin shore at the western end of the fronting beaver dam; NE16-3-42-5W4; see figure and map La17
lat./long.: (centre) 52°35.639'N / 110°38.038'W (0.025') (GPS)

collection: 020719d1 (1 replicate @ ALTA / root / rhizome / stem: 18 – 30 cm / leaf / flower buds / young to mature flowers / young fruit)

photos: J1 (detail of plant growth habit) J2 (detail of plant inflorescence) K2 (general habitat: old beaver dam seen from old lodge, pink flags mark plant groups, see also Eleocharis ?elliptica) K4 (general habitat: old beaver dam looking SSW, pink flags mark plant groups, see also Eleocharis ?elliptica)

plant numbers: 184 plants counted in eight clusters in 1 m X 30 m area; 80 with mature inflorescence having early flowering to mid-fruiting condition

note: possibly associated with Eleocharis ?compressa (*i.e.*, the rare Eleocharis elliptica, pending confirmation of specimen); this is a mid-summer resurvey of 020615f – La9 (habitats 1 and 2); there is a discrepancy from the early summer lat./long. GPS readings which were 52°35.676'N / 110°37.929'W; occasionally lightly grazed

habitat: drawdown beaver pond dam with subhygric sandy organic marsh shrubby mixed marsh meadow fringe of LOW SHRUB (extremely open to open) <1% Cornus stolonifera – Ribes hirtellum – Rosa acicularis – Salix petiolaris – Populus tremuloides (sapling); HERB (semiclosed to closed) 20–50% Scirpus microcarpus var. rubrotinctus; 5–20% SOIL (sandy organics) – LITTER – Carex urticulata; 1–5% **Lycopus americanus** – Lycopus asper – Glyceria striata – Chenopodium rubrum – Mentha arvensis – Carex diandra; <1% Eleocharis palustris var. palustris – Equisetum arvense – Poa palustris – Stellaria calycantha – Calamagrostis inexpansa – Polygonum arenastrum – Urtica dioica var. gracilis – Carex Š Ovales (?bebbii) – Geum macrophyllum var. perincisum – Sonchus uliginosus – Poa ?interior – Rosa acicularis – Anemone canadensis – Aster ciliolatus – Glyceria borealis – Agrostis scabra – Lysimachia thyrsiflora – Erigeron philadelphicum – Galium trifolium – Calamagrostis canadensis – Cirsium arvense – Polygonum lapathifolium – Carex lanuginosa –

Rorippa palustris var. ?hispida - Potentilla norvegica - Solidago canadensis var. canadensis - Plantago major - Sonchus asper - Eleocharis ?compressa (?elliptica)

map/date site: **La18 - Lycoame-020719e**

location: Wainwright Dunes Ecological Reserve; drawdown beaver pond at SE end of the Great Fen, this is the second level dam NE16-3-42-5W4; see figure and map La18
lat./long.: (centre) 52°35.628'N / 110°38.010'W (SW end at 52°35.631'N / 110°38.035'W, NE end at 52°35.625'N / 110°38.980'W) (0.025') (GPS)

collection: 020719e1 (1 replicate @ ALTA / root / rhizome / stem: 14 - 16 cm / leaf / young flower)

photos: K6 (general habitat: old beaver dam, SE end with plant groups marked by pink flags) K7 (population detail, plants on mixed organic / mineral soil)

plant numbers: 36 plants counted in six widely spaced clusters in 1 m X 95 m area (entire dam length); 75% with mature inflorescences having young flowering to mid-fruiting stages

note: this is a mid-summer resurvey of 020615f of habitat 1; there is a discrepancy from the early summer lat./long. GPS readings which are 52°35.676 N / 110°37.929W

habitat: drawdown beaver pond shore with subhygric to mesic sand marsh fringe mixed meadow of LOW SHRUB (extremely open to semiopen) 20-50% Betula occidentalis; 1-5% Rosa acicularis - Cornus stolonifera - Salix petiolaris ; HERB (semiclosed to closed) 5-20% LITTER - Mentha arvensis - Scirpus microcarpus var. rubrotinctus - SOIL (sandy organics); 1-5% Lycopus asper - Scutellaria galericulata - Calamagrostis inexpansa - Typha latifolia; <1% **Lycopus americanus** - Urtica dioica var. gracilis - Eleocharis palustris - Stachys palustris - Potentilla anserina - Crepis tectorum - Vicia americana - Stellaria crassifolia - Vicia americana - Galium trifidum - Ranunculus sceleratus - Calamagrostis canadensis

map/date site: **La19 - Lycoame-020719j**

location: Wainwright Dunes Ecological Reserve; 1.2 km NW of David Lake peninsula's southern tip; SE16-3-42-5W4; see map La19
lat./long.: (centre) 52°35.507'N / 110°37.870'W (0.025') (GPS)

collection: 020719e1 (1 replicate @ ALTA / root / rhizome / stem / leaf / inflorescence: young / flower: young)

photo: K18 (general habitat: old beaver dam of drawdown pond)

plant numbers: 8 plants counted in two clusters of 5 in 0.4 m X 1.5 m area and 3 in 0.2 m X 0.5 m area
note: sandhill crane pair observed flying overhead
habitat: sand plan basin depression and stream course drawdown beaver pond , on old beaver dam with subhygric sand marsh fringe meadow of 20–50% Carex utriculata; 5–20% Carex aquatilis – Calamagrostis canadensis; 1–5% Salix lutea (saplings) – Cornus stolonifera (saplings); <1% Scutellaria galericulata – Lysimachia thyrsiflora – Glyceria striata – Mentha arvensis – **Lycopus americanus** – Rorippa palustris – Stellaria longifolia

map/date site: **La20 – Lycoame-020721a**
location: Wainwright Dunes Ecological Reserve; 2 km NNW of David Lake peninsula's southern tip; SE9-10-42-5W4; see figure and map La 20
lat./long.: (centre) 52°36.141'N / 110°37.748'W (0.025') (GPS)
collection: 020721a1i (1 replicate @ ALTA / root / rhizome / stem: 42 cm / leaf / flower: young to mature / fruit: submature) 020721a1ii (1 replicate @ UAC / root / rhizme / stem: 15 – 19 cm / leaf / flower: young to mature)
photos: K24 (general habitat: beaver pond drawdown marsh) K25 (habitat detail: beaver pond drawdown marsh, scale to ruler)
plant numbers: over 150 plants counted in 4 m X 5 m area; 90% in mature inflorescence with young to mature flowers and young fruit
note: adjacent to site 020714a; marked by flag on nearby Betula occidentalis
habitat: sandland stream channel drawdown beaver pond shore with subhygric sandy marl marsh fringe mixed meadow of 5–20% LITTER – Glyceria grandis – MOSS; 1–5% Juncus nodosus – **Lycopus americanus** – Salix bebbiana (seedlings) – Carex diandra – Carex utriculata – Stellaria longifolia; <1% SOIL (sandy marl) – Glyceria striata – Lysimachia thyrsiflora – Poa palustris – Juncus bufonius – Eleocharis palustris – Galium trifidum – Polygonum lapathifolium – Carex prairea – Rumex occidentalis – Urtica dioica var. gracilis – Rorippa palustris – Agrostis scabra – Carex bebbii – Juncus tenuis var. dudleyi

map/date site: **La21 – Lyco020815f**
location: Wainwright Dunes Ecological Reserve; backshore tall thicket north end of David Lake, 800 m NNE of David Lake peninsula's southern tip; NW2-9-42-5W4; see figure and map La21
lat./long.: (centre) 52°35.412'N / 110°36.508'W (0.025') (GPS)
UTM27: (centre) 12N 0526525E 5826540N (30m) (GPS)
collection: none
photo: none

plant numbers: 70 plants counted in 15 m X 40 m area sampled, probably many more; 20% with inflorescences at mid- to late flowering to early fruiting

note: associated with Gentiana fremontii (020815f); many species associated with the seepage slope habitat present; situated between balsam poplar – trembling aspen forest (70 m to north) and the Deschampsia cespitosa lake backshore meadow (35 m to the south); signs of light and local grazing (30% intensity)

habitat: drawdown lake backshore subhygric seepage tall thicket with TALL SHRUB (semiopen) 50–75% Salix maccalliana – Betula occidentalis – Populus balsamifera (saplings); LOW SHRUB (semiopen) 20–50% Salix petiolaris – Betula occidentalis – Populus balsamifera (seedlings) – Salix maccalliana – Salix pseudomonticola; HERB (semiclosed to closed) 5–20% LITTER – Muhlenbergia richardsonii – Deschampsia cespitosa – Juncus balticus – Potentilla anserina – Carex aurea; 1–5% Carex scirpoidea – Carex capillaris subsp. chlorostachys – Fragaria virginiana – Agropyron trachycaulum subsp. trachycaulum – Crepis runcinata – Glyceria striata – Carex viridula – Viola nephrophylla – Sonchus uliginosus – Eleocharis quinqueflora; <1% Equisetum arvense – Juncus longifolius – Carex utriculata – **Lycopus americanus** – Senecio pauperculus – Parnassia palustris – Solidago canadensis – Lobelia kalmii – Poa interior – Antennaria parvifolia – Taraxacum officinale – Dodecatheon pulchellum – Sisyrinchium montanum – Glaux maritima – Aster borealis – Gentianella amarella – Platanthera hyperborea – Galium boreale – Juncus nodosus – Muhlenbergia glomerata – Sonchus uliginosus – Mentha arvensis – Vicia americana – Rosa acicularis

map/date site: La22 – Lycoame-020818e

location: adjacent to Wainwright Dunes Ecological Reserve boundary; southwest end of David Lake, 600 m SSW of David Lake peninsula's southern tip; SE14–35–41–5W4; see figure and map La22
lat./long.: (centre) 52°34.617'N / 110°37.248'W (0.025') (GPS)
UTM27: (centre) 12N 0526697E 5825063N (30m) (GPS)

collection: 020818e1 (1 replicate @ ALTA / root / rhizome / stem: 8 – 25 cm / fruit: young to submature)

photo: P18 (general habitat: see Gentiana fremontii 020818d)

plant numbers: 5 plants in 0.2 m X 1 m area, samples from a 15m X 30m area; 100% in mature inflorescence with young to mature flowers and young to submature fruits

note: thicket 1.2 m to 1.5 m tall; associated with Gentiana fremontii 020818d

habitat: drawdown lake backshore subhygric seepage with open tall thicket of

TALL SHRUB (open) 20–50% Salix maccalliana; 5–20% Salix lutea; 1–5% Salix pseudomonticola; LOW SHRUB (very open) 1–5% Salix lutea; <1% Salix sericea – Salix candida; HERB (semiclosed to closed) 5–20% LITTER – Calamagrostis stricta – Carex aurea; 1–5% Viola nephrophylla – Juncus balticus – **Lycopus americanus** – Potentilla anserina – Solidago canadensis – Crepis runcinata – Carex viridula; <1% Calamagrostis inexpansa – Glaux maritima – Taraxacum officinale – Senecio pauperculus – Parnassia palustris – Senecio uliginosus

map/date site: **La23 – Lycoame-020819a**

location: Wainwright Dunes Ecological Reserve; 600 m north of David Lake central north shore, 1 200 m NNE of David Lake peninsula's southern tip; SE2-11-42-5W4; see figure and map La23
lat./long.: (centre) 52°35.692'N / 110°36.817'W (0.025') (GPS)
UTM27: (centre) 12N 0526173E 5827057N (30m) (GPS)

collection: 020819a1 (1 replicate @ ALTA / mature plant / root / rhizome / stem: 25 - 35 cm / leaf: mature / fruit: submature)

photo: none

plant numbers: 93 plants counted in seven groups in 10 m X 60 m area; about 15% in flower or fruit, mostly vegetative and somewhat squat in stature, the flowering / fruiting specimens taller and branching

note: appearing to be associated with the disturbed mineral soils occurring where the access wildlife trails enter the fen basin; this may be in the general location identified in the Significant Features map of Cottonwood 1986 (see La3)

habitat: calcareous seepage basin fringe; all plants within 4 m of basin margin with fringe of hygric calcareous mucky sand tall thicket fen of TALL SHRUB (semiclosed) Betula occidentalis (22%) – Salix pseudomonticola (16%) – Salix sericea (8%); LOW SHRUB (semiopen) Cornus stolonifera (5%); HERB (semiclosed to closed) 5–20% Carex aquatilis – LITTER; 1–5% Carex utriculata – Viola nephrophylla – Cicuta maculata – Carex leptalea – **Lycopus americanus** – SOIL (calcareous marl) – Rubus pubescens – Anemone canadensis; <1% Anemone canadensis – Carex interior – Glyceria striata – Mentha arvensis – Carex capillaris subsp. chlorostachys – Lysimachia thyrsiflora – Taraxacum officinale – Plantago major – Aster borealis – Carex diandra

map/date site: **La24 – Lycoame-020819b**

location: Wainwright Dunes Ecological Reserve; 600 m north of David Lake central north shore, 1 200 m NNE of David Lake peninsula's southern tip; SE2-11-

42-5W4; see figure and map La 24
lat./long.: (centre) 52°35.684'N / 110°36.798'W (0.025') (GPS)
UTM27: (centre) 12N 0526195E 5827040N (30m) (GPS)

collection: 020819b1 (1 replicate @ ALTA / mature plant / stem: 38 – 42 cm / leaf / fruit: submature)

photo: P21 (general habitat: active seepage slope shrubby graminoid fen, see also Gentiana fremontii)

plant numbers: 12 plants counted in 1 m X 3 m area; all with mature inflorescences at early flowering to early fruiting

note: cattle and moose trails present; see also Lycoame-020819a

habitat: active calcareous seepage slope (14° to 18° toward 180° – S) with hygric to subhydric calcareous sand with shrubby graminoid fen of TALL SHRUB (semiclosed) Betula occidentalis (8%); LOW SHRUB (semiopen) Betula occidentalis (4%); HERB (semiclosed to closed); 5–20% Carex utriculata – LITTER – Carex viridula; 1–5% Carex aurea – Eleocharis quinqueflora – SOIL (marly sand) – Viola nephrophylla – Rubus pubescens – Solidago canadensis; <1% **Lycopus americanus** – Lobelia kalmii – Gentiana crinita – Glyceria striata – Parnassia palustris – Carex interior – Aster borealis – Mentha arvensis – Muhlenbergia glomerata

Photos: Photographs of habitats and species locations for *Lycopus americanus* in the Wainwright Dunes Ecological Reserve

- La7—Lycoame-020615f
  - B11 (general habitat: drawdown beaver pond and dam)

- La8—Lycoame-020615l
  - B13 (habitat detail: west end of beaver dam, seedlings on sandy substrate)

- La9—Lycoame-020616a
  - B15 (general habitat: beaver dam crest)

- La10—Lycoame-020712a
  - F7 (general habitat: backshore tall thicket of Salix maccalliana)

- La11—Lycoame-020712b
  - F6 (general habitat: backshore tall thicket of Betula occidentalis)

- La13—Lycoame-020714a
  - E17 (detail of plant: portrait, mid-flowering)

  - E18 (detail of plant: portrait, mid-flowering)
  - E19 (detail of population: plant cluster)
  - E20 (detail of population: plant cluster)
  - F11 (habitat 1 at SE end of dam, pink flags mark plant locations)
  - F12 (habitat 1 in central portion of dam, plant among tall graminoids, pink flags mark plant locations)
  - F13 (habitat 2, habitat detail: in drawdown pond shore and basin, plants among Juncus nodosus, Calamagrostis canadensis, Glyceria grandis)

- La16—Lycoame-020719c
  - K5 (general habitat: old beaverdam, pink flags mark plant locations)

- La17—Lycoame-020719d
  - J1 (detail of plant growth habit)
  - J2 (detail of plant inflorescence)
  - K2 (general habitat: old beaver dam seen from old lodge, pink flags mark plant groups, see also Eleocharis ?elliptica)
  - K4 (general habitat: old beaver dam looking SSW, pink flags mark plant groups, see also Eleocharis ?elliptica)

- La18—Lycoame-020719e
  - K6 (general habitat: old beaver dam, SE end with plant groups marked by pink flags)
  - K7 (population detail: plants on mixed organic / mineral soil, scale to ruler)

- La19—Lycoame-020719j
  - K18 (general habitat: old beaver dam of drawdown pond)

- La20—Lycoame-020721a
  - K24 (general habitat: beaver pond drawdown marsh)
  - K25 (habitat detail: beaver pond drawdown marsh, scale to ruler)

- La22—Lycoame-020818e
  - P18 (general habitat: see Gentiana fremontii 020818d)

- La24—Lycoame-020819b
  - P21 (general habitat: active seepage slope shrubby graminoid fen)

Veronica catenata Pennell.—water speedwell—_SCROPHULARIACEAE_

This perennial procumbent low herb of a variety of lowland sites has a provincial Rank of **S2S3** in Alberta, and a global Rank of **G5** (Vujnovic & Gould 2002, ANHIC 2002). This is one of the three native species of *Veronica* occurring in Alberta that have somewhat open racemes which arise from the leaf axils and have strictly glabrous leaves that are more than three times as long as wide. It may be distinguished by its sessile leaves from *Veronica americana* (which has petioled leaves), and by the clasping bases of the leaves from *Veronica scutellata* (which has merely sessile leaf bases). Additionally it differs from the non-native *Veronica anagallis-aquatica*, with which it may be confused, but which previously has not been reported in Alberta, by its shorter leaves that are less than three times as long as wide, and has pedicels that are strongly ascending or upcurved (Scoggan 1979). This species includes *Veronica comosa* Richt. var. *glaberrima* (Pennell) Boivin and *Veronica salina auct. non*. However, it is not recorded under any of the above synonyms in the NatureServe data base of 2003.

It occurs across North America in virtually all the provinces and states, and is rare in Alberta and in 3 states (Kershaw *et al.* 2001). It has been mapped in Alberta from west of Calgary in the Grassland Natural Region (Kershaw *et al.* 2001), and has 21 known locations in the province (ANHIC 2003) but apparently with no records reported in the Parkland Natural Region (ANHIC 2002). The record of its occurrence in the vicinity of Wainwright Dunes Ecological Reserve was presented in the biophysical study of the reserve and its general vicinity by L. and C. Bradley (1977) that was reported in the species list in Fehr's (1984) inventory of the general area. However, no information was available for the location or number of individuals, and Fehr himself apparently did not observe the species, so it was not his community sample data. As well, this species was not repeated in the study of Cottonwood Consulting, Ltd. (1986) nor in the accumulative list in the Reserve's management plan (Anon 1998), hence its presence already may have been discounted with the authorative editing for that report. The species was not observed during the 2002 survey, hence there is no recent location information available.

The habitat of this species in the province appears to be quite diverse, including marshy, muddy or gravelly ground and shallow water by ponds and streams, and in ditches (Kershaw *et al.* 2001, Moss 1983). The reported habitat of the Bradley's in Fehr (1984) was "wet area near beaver lodge". If the species actually occurs within the Reserve's boundaries, the only beaver lodge recorded still existing was in the large pond at the southeastern side of the Great Fen area, 1.3 km northwest of David Lake, at about 52°35.660'N / 110°37.975'W. This habitat was surveyed for this species in 2002, but none was found. The drawdown conditions of the pond shoreline habitats may have both altered and eliminated some former and potential habitat sites, but also created newer successional sites for the species.

Any habitat threats for this species would be associated with the drawdown conditions of any wetland shores where it might occur that are caused by the prolonged drought or by cessation of beaver activity. Additionally, there may be impacts from trampling or browsing by wildlife or cattle.

The first management concern for this species would be to find any vouching records for this species within the Reserve boundaries. No collection could be located by the author in the Alberta Parks and Protected Areas or University of Calgary herbaria, and the other herbaria (Alberta Provincial Museum, University of Alberta,) could not be examined for this species. Any potential occurrence of the species recorded by the author during the survey of the study area was determined to be the common *Veronica americana*. Any discoveries of records or existing populations should be resurveyed and monitored.

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Veronica catenata* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION (probably characteristics)	
Exposure Type	frost (4)
Flood Hazard	may be expected (4)
Soil Drainage	imperfectly drained (5), poorly drained (6)
Perviousness	moderately (2)
Site: Macro	not apply
Site: Meso	depression (6), level (7)
Site: Micro	irregular (5), straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	hygric (7), subhygric (5), subhydric (8)
Nutrients	?mesotrophic (3)
Successional Status: 1	young seral (2)
Successional Status: 2	not apply
Disturbance Factors	water (8)

ANHIC RARE NATIVE PLANT REPORT	
Phenology: vegetative	no information (?mid- to late June to early July)
Phenology: reproductive - inflorescence	no information (?late June to early September)
Phenology: reproductive - flower	no information (?late June to early September)
Phenology: reproductive - fruit	no information (?early to mid- to late July, to early September)
Habitat Threats	drought drawdown of pond habitat
Management Considerations	rediscover and monitoring populations

Species location summary for *Veronica catenata* in the Wainwright Dunes Ecological Reserve

map site/date site	location coordinates	number (size)	habitat
Vc1-Verocat-84xxxxa	no information	no information	wet area near beaver lodge

PREVIOUSLY REPORTED SPECIES LOCATIONS

map/date site:	**Vc1 - Verocat-84xxxxa**
location:	Wainwright Dunes Ecological Reserve // NW7-16-2-5W4 // about 52°35.660'N / 110°37.975'W
source:	Fehr, A. 1984. Appendix 5: Annotated list of non-vascular and vascular plant in the Wainwright Dunes study area.
references:	Bradley, L. and C. Bradley. 1977. Aspen Grove resource assessment: Wainwright area. Parks Planning and Design Branch, Alberta Recreation, Parks and Wildlife, Edmonton. Fehr, A. 1984. Wainwright Study Area: Biophysical Inventory. Natural Areas Program, Public Lands Division, Alberta Energy and Natural Resources, Technical Report No. t/65, Edmonton.
observation:	L. & C. Bradley 1977
collection:	no information
photo:	no information
plant numbers:	no information
note:	unconfirmed occurrence!
habitat:	wet area near beaver lodge
comment:	The species list of Fehr's 1984 report cites the Bradley's 1977 report for this species occurrence in the reserve or its vicinity. The species was not observed in the 2002 survey, and no vouching specimen could be found at the herbaria of Alberta Parks and Protected Areas or University of Calgary.

RECENTLY DISCOVERED SPECIES LOCATIONS

(none)

Map: Species locations for *Veronica catenata* in the Wainwright Dunes Ecological

Reserve

(no locations available)

Figure: Location maps and habitat diagrams for *Veronica catenata* in the Wainwright Dunes Ecological Reserve

(none)

Photo: Photographs of habitats and plant locations for *Veronica catenata* in the Wainwright Dunes Ecological Reserve

(none)

Hedyotis longifolia (Gaertn.) Hook.**—long-leaved bluets—*RUBIACEAE***

This low perennial herb of sandy soil in open woods, dunes and grassland habitats has a provincial Rank of **S2** in Alberta, and a global Rank of **G4G5** (Vujnovic & Gould 2002, ANHIC 2002). It has loosely tufted stems that are 10 cm to 25 cm tall, with small, linear, opposite, sessile leaves with purplish stipules. The inflorescence is terminal cymes of white, pink or light blue flowers that have four spreading lobes and a long tube and narrow sepals, and the fruit is a capsule. It also has been called *Houstonia longifolia* Gaertn. The only other member of this genus in Canada that has similar leaf and inflorescence is *Hedyotis canadensis*, an eastern species that does not enter the prairie provinces, and the other similar member in the northern United States, *Hedyotis nigricans*, does not extend further west than the Great Lakes. It bears a passing resemblance to several species of the genera *Cerastium* and *Stellaria*, but they differ in having separate petals, rather than petals joined at their base (Moss 1983, Gleason & Cronquist 1991).

The species occurs in the eastern half of North America from the southern part of western Canada to the Maritimes in five provinces, and southward in 35 states from east central United States to its east coast (NatureServe 2003). It is rare in Alberta, Saskatchewan and Quebec, and in five states, and indeed, is considered to have been extirpated from two states (NatureServe 2003, Kershaw *et al.* 2001). In Alberta it has 15 known locations from the Parkland and southern Boreal Natural Regions, with several in the vicinity of Wainwright (ANHIC 2003, Kershaw *et al.* 2001). It was reported from the Wainwright Dunes Ecological Reserve by Cottonwood Consulting, Ltd. (1986) where it was indicated on the sensitive features map as occurring in a sandland aspen grove complex 2.5 km northwest of David Lake. The area was inspected during the 2002 project, but no plants were recorded, perhaps due to the drought conditions, and no population size was indicated in the original source.

The general area where the species was reported from is an aspen successional forest and grove complex. Fehr (1984) did not have a community sample from this area, but the associated vegetation was a semiopen, low tree cover of *Populus tremuloides*, with open tall shrub cover of aspen saplings, *Salix bebbiana*, *Prunus virginiana* and *Elaeagnus commutata*, a semiclosed low shrub cover of *Rosa acicularis*, *Prunus virginiana*, *Spiraea alba* and *Juniperus communis* (common juniper), and a semiclosed herb cover of *Carex siccata*, *Oryzopsis asperifolia*, *Oryzopsis pungens*, *Galium boreale*, *Smilacina stellata*, *Thermopsis rhombifolia*, *Fragaria virginiana*, and others.

Habitat threats at this time may be the prolonged drought conditions in the habitat that may have arrested the development of the plants. Fire probably greatly affected this site in the past but recent burning signs were not evident. Grazing was not evident in this portion of the Reserve, and the species is small enough as not to be a favoured grazing species.

Management considerations should include a mid-summer resurvey of this aspen grove for the occcurrence of this species under moister climatic conditions. The impacts of fire and continued cattle grazing management in the area should be evaluated prior to any future burns or increase in grazing pressures.

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Hedyotis longifolia* in the Wainwright Dunes Ecological Reserve

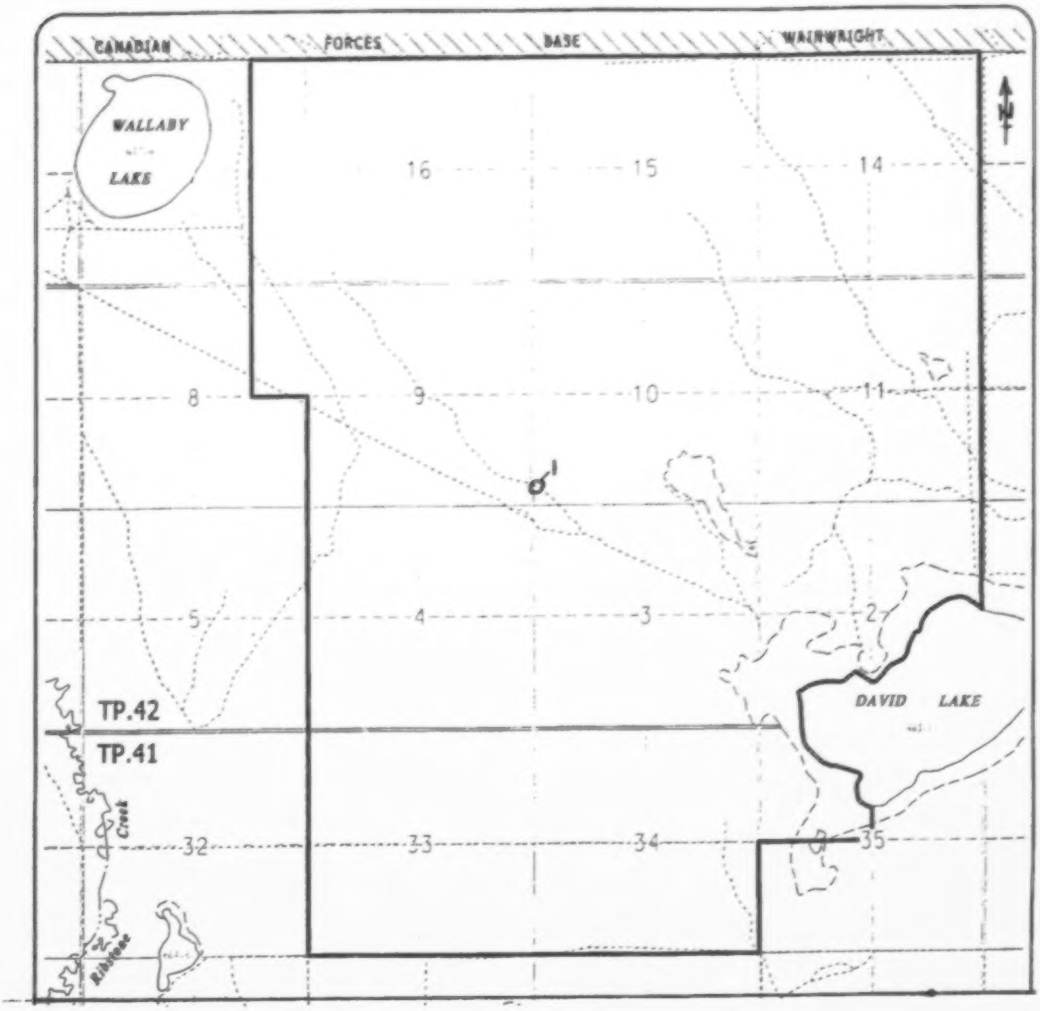
ECOLOGICAL LAND SURVEY SITE DESCRIPTION	
Exposure Type	not apply
Flood Hazard	not apply
Soil Drainage	well drained (3)
Perviousness	moderately (2)
Site: Macro	plain (7)
Site: Meso	depression (6)
Site: Micro	straight (1)
Site: Surface Shape	concave (2)
Ecological Moisture Regime	submesic (4)
Nutrients	?submesotrophic (2)
Successional Status: 1	young seral (2)
Successional Status: 2	not apply
Disturbance Factors	fire (4)

ANHIC RARE NATIVE PLANT REPORT	
Phenology: vegetative	no information
Phenology: reproductive - inflorescence	no information (June to July)
Phenology: reproductive - flower	no information (July?)
Phenology: reproductive - fruit	no information (August?)
Habitat Threats	trampling, grazing, fire
Management Considerations	monitoring populations, limiting access

Species location summary for *Hedyotis longifolia* in the Wainwright Dunes Ecological Reserve

map site /date site	location coordinates	number (size)	habitat
HI1 – Hedylon-86xxxxa	UTM27 523600E 5827100N	no information	aspen grove

Map: Species locations for *Hedyotis longifolia* in the Wainwright Dunes Ecological Reserve (o indicates approximate reported location)


CANADIAN FORCES BASE WAINWRIGHT
N
WALLABY LAKE
16
15
14
8
9
10
11
1
5
4
3
2
TP.42
TP.41
DAVID LAKE
Creek
32
33
34
35
Ribstone

PREVIOUSLY REPORTED SPECIES LOCATIONS

map/date site:	**HI1 - Hedylon-86xxxxxa**
location:	Wainwright Dunes Ecological Reserve; 2.5 km NW of David Lake peninsula's southern tip; about 52°35.750'N / 110°39.000'W (0.050'); UTM27 523600E 5827100N(100 m) ; 4-10-42-4W5; see map HI1
source:	Cottonwood Consulting, Ltd. 1986. (Significant Features Map)
reference:	1) Cottonwood Consulting, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton.
observation:	C. Wallis 1986?
collection:	no information; no collection at PP
photo:	no information
plant numbers:	no information
note:	none
habitat:	aspen grove
comment:	no plants rediscovered during 2002 survey

RECENTLY DISCOVERED SPECIES LOCATIONS

(none)

Photo: *Hedyotis longifolia* in the Wainwright Dunes Ecological Reserve

(none)

Figure: Location maps and habitat diagrams for *Hedyotis longifolia* in the Wainwright Dunes Ecological Reserve

(none)

Photo: Photographs of habitats and species locations for *Hedyotis longifolia* in the Wainwright Dunes Ecological Reserve

(none)

Aster pauciflorus Nutt.**—few-flowered aster—*ASTERACEAE***

This low, late-flowering herb of alkaline flats has a provincial Rank of **S2** in Alberta and global rank of **G4** (Vujnovic & Gould 2002, ANHIC 2002). This species also is known as *Almutaster pauciflorus* (Nutt.) A. & D. Love (marsh alkali aster) (NatureServe 2003). It may be differentiated from the several asters of similar habitats in the study area, notably *Aster ericoides, Aster borealis* (marsh aster) and *Aster brachyactis* (rayless aster), by its narrow, somewhat leathery leaves that are not auriculate and reduce in size upwards along the stem to resemble bracts, its stem which often is procumbent and is increasingly glandular into the inflorescence and flower bracts, its rather loose and unequal three-tiered involucral bracts, and its white to bluish ray flowers (Moss 1983, Scoggan 1979, Gleason & Cronquist 1991).

This species occurs in west central North America, in Canada from the Northwest Territories to Manitoba, and in the southwestern third of the United States through Wyoming and the Dakotas. It is rare in Alberta and in two of the northern states (NatureServe 2003, Kershaw *et al.* 2001). It has 28 known locations in Alberta, in the vicinity of Red Deer, Medicine Hat and Wainwright (Kershaw *et al.* 2001, ANHIC 2003), and Wallis (1990) listed it from eleven areas in his survey of saline wetlands and springs in southeastern Alberta. It was first reported by Wallis (1990) from the north side of David Lake, apparently east of the base of the peninsula, and was next located by Miejer (2001), also offshore from the base of the peninsula. An additional eight locations were discovered during the current survey within the Wainwright Dunes Ecological Reserve boundaries to the northeast and east of the David Lake peninsula as a mixture of isolated small clusters, and off the southern tip of the peninsula as a much larger population. As well, outside the Ecological Reserve boundaries along the eastern offshore of David Lake, there was a notably large population that probably extended well to the southwest along the offshore. Additionally, it is likely that there are other populations around the David Lake basin, particularly on its western side within the ecological reserve boundaries, and on the southeastern and southern sides outside the boundaries. Investigation of the calcareous spring to the north of David Lake and around the Great Fen did not reveal additional populations.

A total of 551 individual plants of this species were counted in seven localities within the boundaries of the Ecological Reserve, all along the north side of David Lake and along the eastern side of its peninsula, while outside of the Reserve 6 000 were estimated along the lake basin's eastern side, and in all likelihood, the total number of plants from around the lake's entire shore may well approach 10 000. The eight locations on the northeastern and eastern sides of the David Lake peninsula supported single to a dozen plants, and larger population off the southern tip of the peninsula had over 500 plants in a 45 m X 110 m area. In the Reserve in 2002, the species developed its inflorescence in early August, and came into flower between mid-to late August and probably to mid-September, with only a few flowers expanding on any one day. Indeed, the petals did not open until the late morning, so that any early morning observations may have overlooked the presence of these star-like flowers. It produced fruit from late August to mid- or late September.

Wallis' 1990 study of saline wetlands and springs in the Grassland and Parkland Natural Regions of Alberta recorded the species generally as being rare to locally common in springs, wet meadow outflows from springs and lake backshores. At Reflex (Old Salt) Lake to the southeast of Chauvin, east of the reserve, he recorded it as occurring "along the lakeshore of a hypersaline lake with sandy and generally saline shore", with associated species there and elsewhere including *Muhlenbergia asperifolia, Carex parryana* and *Gentiana aquatilis* (*i.e., fremontii*), as generally is the case with its species locations here. The most notable habitat for the species was the drawdown offshore barrens of the David Lake basin with its very open, exposed alkaline sand, having over 10% cover of *Glaux maritima, Scirpus pungens, Juncus balticus, Muhlenbergia asperifolia, Potentilla anserina,* and *Agropyron trachycaulum* subsp. *trachycaulum* and subsp. *subsecundum*. This habitat supported the larger populations in the David Lake basin, and included vast populations of *Muhlenbergia asperifolia*. Also supporting smaller and more discrete locations for this species that were were the offshore meadows that extended from the high water level line for about 150 m into the David Lake basin. These tended to have a semiclosed cover consisting of the above associated species that occurred among the hummocky terrain caused by long-term cattle trampling while grazing in the offshore meadows, and probably is the habitat referred to by Meijer (2001). A less common habitat in the study area was the semiopen shrubby meadow along the northern backshore of David Lake where there may have been some groundwater seepage influence. Here the cover was low shrubs of *Salix petiolaris* and *Betula occidentalis* and a more closed herb cover of *Juncus balticus, Potentilla anserina, Carex scirpoidea, Agropyron trachycaulum* subsp. *subsecundum* and others.

The potential for habitat threats to the populations here must inextricably be linked to the fluctuation of the water level of David Lake, particularly since virtually all the species locations were concentrated in the currently submesic, drawdown zone between about 20 m and 100 m offshore from the former high water level line. A return to the high water levels of previous years, however welcome for the other rare species such as *Ruppia cirrhosa*, would probably greatly reduce the extent of the populations of this species and the rare *Muhlenbergia asperifolia* and *Carex parryana*. Grazing did not appear to present an immediate threat to the populations except as an incidental impact from trampling and occasional browsing. The cattle tended to gravitate to the comparatively more lushly developing *Hordeum jubatum*-dominated graminoid cover of the offshore and did not dwell in the short and sparse meadows and barrens. It was observed, however, that grazing in the denser offshore *Juncus balticus* swards may at least locally have removed the shading of the graminoid cover and apparently 'released' the plants. Management considerations should include monitoring the current populations to ascertain how well they are surviving the drought conditions and prolonged drawdown of the alkaline lake bed. It is likely that when the drought ends and the lake level rises, the population will be greatly reduced and probably will be restricted to its currently more marginal habitats; However, undoubtedly, the rhizome, and possibly also the seed banks, will persist to take advantage of another drawdown period. The impact of grazing also could be examined, although as noted above, at this time it did not appear to be significantly detrimental.

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Aster pauciflorus* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	not apply
Flood Hazard	may be expected (3)
Soil Drainage	poorly drained (6), imperfectly drained (5), moderately well drained (4)
Perviousness	slowly (3), moderately (2)
Site: Macro	plain (7), valley floor (6)
Site: Meso	level (7), depression (6)
Site: Micro	straight (1)
Site: Surface Shape	straight (1)
Ecological Moisture Regime	hygric (7), subhygric (6)
Nutrients	?hypereutrophic (6)
Successional Status: 1	young seral (2)
Successional Status: 2	pioneer (1)
Disturbance Factors	water related (8)

ANHIC RARE NATIVE PLANT REPORT

Phenology: vegetative	mid- to late July, early to mid-August
Phenology: reproductive	early to mid- to late August
Phenology: reproductive - flower	mid- to late August, early September
Phenology: reproductive - fruit	late August, early to late September
Habitat Threats	flooding, grazing
Management Considerations	monitoring populations, limiting access

Species location summary for *Aster pauciflorus* in the Wainwright Dunes Ecological Reserve

map site/date site	location coordinates	number (size)	habitat
Ap1 – Astepau-90xxxxa	UTM27 526500E 5826250W	no information	wet saline & subsaline lakeshores
Ap2 – Astepau-010731a	UTM27 526300E 5826396W	10 plants	wet saline & subsaline lakeshores and edges & hummock meadows
Ap2 – Astepau-010731a	UTM27 526342E 5826482W	8 plants	wet saline & subsaline lakeshores and edges & hummock meadows
Ap3 – Astepau-020815a	52°34.900'N 110°35.875'W	6000 (54m X 300m)	drawdown lake alkaline nearshore
Ap4 – Astepau-020815e	52°35.372'N 110°36.346'W	1 (0.1m X 0.2m)	backshore open thicket
Ap5 – Astepau-020817a-i	52°35.276'N 110°36.718'W	1 (1m X 1m)	drawdown backshore alkali meadow
Ap6 – Astepau-020817a-ii	52°35.247'N 110°36.711'W	1 (0.1m X 0.2m)	drawdown backshore alkali meadow
Ap7 – Astepau-020817a-iii	52°35.227'N 110°36.723'W	1 (0.1m X 0.2m)	drawdown backshore alkali meadow
Ap8 – Astepau-020817a-iv	52°35.272'N 110°36.666'W	14 (1m X 3m)	drawdown backshore alkali meadow
Ap9 – Astepau-020817a-v	52°35.298'N 110°36.654'W	8 (3m X 18m)	drawdown backshore alkali meadow
Ap10 – Astepau-020817b	52°35.230'N 110°36.695'W	3 (5m X 5m)	drawdown backshore alkali meadow

map site/date site	location coordinates	number (size)	habitat
Ap11 - Astepau-020818a	52°34.973'N 110°36.893'W	521 (45m X 110m)	lake nearshore drawdown meadow

Map: Species locations for *Aster pauciflorus* in the Wainwright Dunes Ecological Reserve (o indicates approximate reported location)

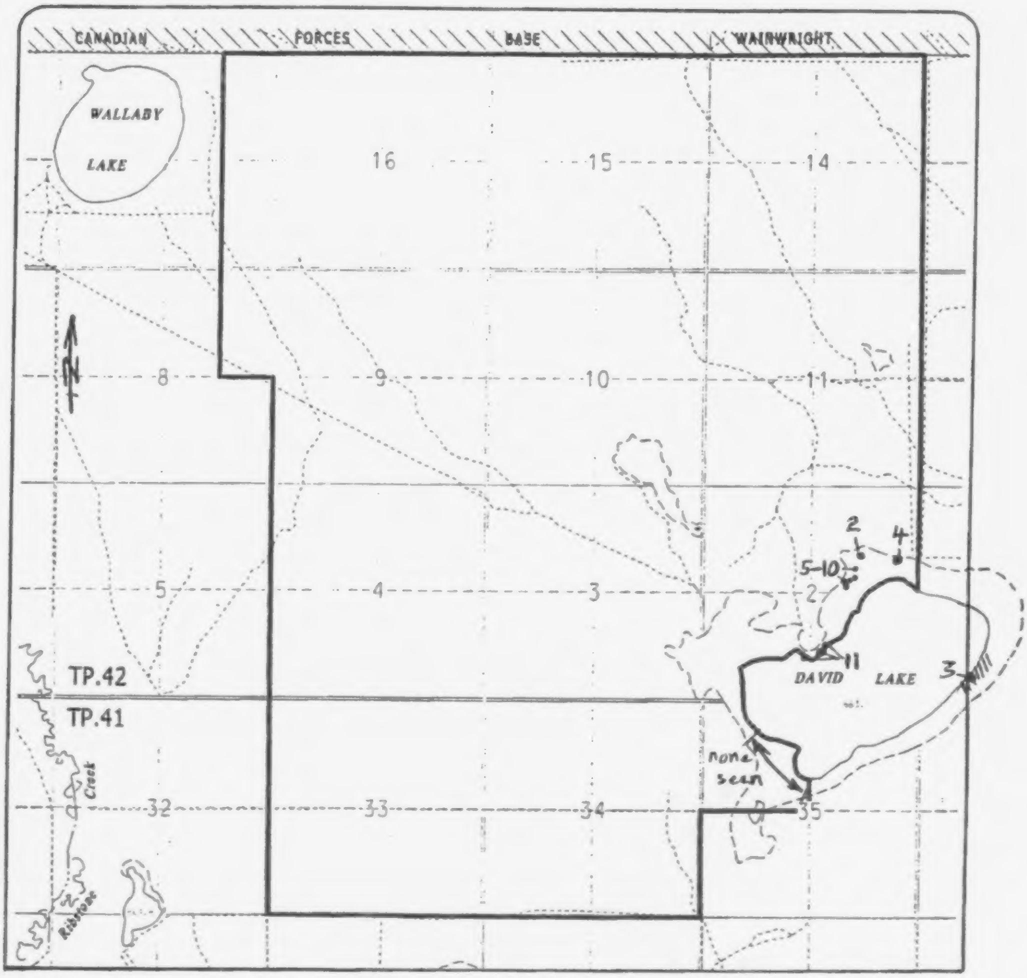
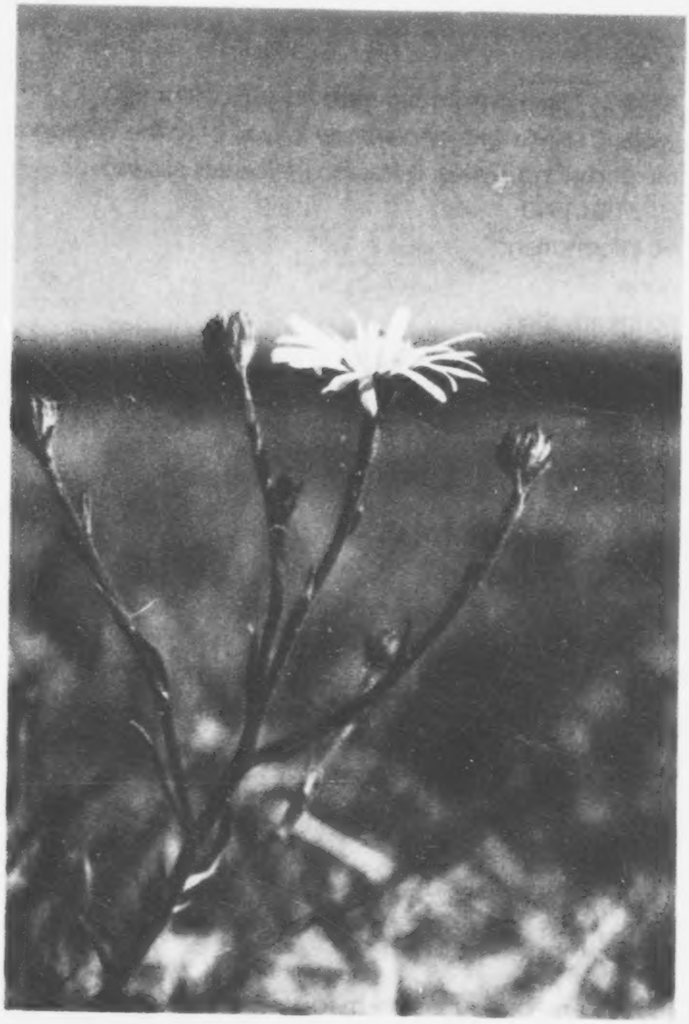

CANADIAN FORCES BASE WAINWRIGHT
WALLABY LAKE
N
16
15
14
8
9
10
11
5
4
3
2
TP.42
TP.41
32
33
34
35
Ribstone Creek
DAVID LAKE
2
4
5-10
11
3
none seen

Photo: *Aster pauciflorus* (few-flowered aster) plant detail: inflorescence and flower (Ap3—Astepau-020815a–O23, photo Ian D. Macdonald)



PREVIOUSLY REPORTED SPECIES LOCATIONS

map/date site: **Ap1 - Astepau-90xxxxa**
location: Wainwright Dunes Ecological Reserve / T41-R5-W4 & T42-R5-W4 // David Lake // UTM27 526500E 5826250N (polygon mapping only) // see map Ap1
source: ANHIC // Element Occurrence PDASTEL010 # 020
reference: Wallis C. 1990. Reconnaissance Survey of Saline Wetlands and Springs in the Grassland-Parkland Region of Eastern Alberta
observation: C. Wallis 1990
collection: no information
photo: none
plant numbers: no information
note: none
habitat: "wet saline and subsaline meadows round lake" / 665 m
comment: location given in probably the NW side of David Lake; probably 5/6?-2-42-5W4

map/date site: **Ap2 - Astepau-010731a**
location: Wainwright Dunes Ecological Reserve / T41-R5-W4 & T42-R5-W4 // David Lake // UTM27? 526300E 5826396N and UTM27? 526342E 5826482N // see map Ap2
source: ANHIC // Element Occurrence PDASTEL010 # 020
reference: Meijer, M. 2001. Survey of Rare Plant Element Occurrences in the Central Parkland Natural Subregion (includes Rare Native Plant Report Forms)
observation: M. Meijer 31 July 2001
collection: no information
photo: no information
plant numbers: UTM27? 526300E 5826396N = 10 plants // UTM27? 526342E 5826482N = 8 plants
note: none
habitat: "wet saline and subsaline meadows round lake; higher subsaline edges and on hummocks" / 665 m
comment: these locations are on the eastern side of the peninsula base, about 700 m NNE of peninsula's southern tip; probably 10-2-42-5W4

map/date site:	**Ap3 - Astepau-020815a**
location:	adjacent to Wainwright Dunes Ecological Reserve; David Lake, central eastern shore, 1.2 km ESE of peninsula's southern tip; SE/NE4-1-42-5W4; see figure and map Ap3
lat./long.:	(centre) 52°34.900'N / 110°35.825'W (between A: 52°34.958'N / 110°35.753'W, B: 52°34.972N / 110°35.858'W, C: 52°34.836'N / 110°36.025'W, and D: 52°34.830'N / 110°35.986'W) (0.05') (GPS)
collection:	020815a1 (1 replicate @ ALTA / root / rhizome / stem: procumbent, 8 - 20 cm / inflorescence: full / flower: bud 20%, preflower 65%, mature flower 15%)
photos:	see also Carex parryana photos; N1 (general habitat: drawdown lake offshore, looking N) N2 (general habitat: drawdown lake offshore, looking E at backshore thicket fringe) N3 N4 (habitat detail: drawdown lake offshore ground cover, scale to ruler) N5 N17 N18 (general habitat: drawdown lake offshore, looking NE toward backshore thicket fringe, with Muhlenbergia asperifolia & Carex parryana) O19 O20 (plant detail: plant growth habit) O21 O22 O23 (plant detail: and inflorescence)
plant numbers:	6 000 plants estimated in 54 m X 300 m area; 85% in developing to mature inflorescence having 10 - 15% with mature flowers
note:	associated with Muhlenbergia asperifolia and Carex parryana; occurs in a zone about 75 m offshore (to NW) from lake backshore thicket along high water level; zone is about 54 m broad and apparently does not extend further out into the drawdown basin; to the backshore side is a meadow of Hordeum jubatum - Potentilla anserina - Glaux maritima - Agropyron trachycaulum subsp. trachycaulum - Juncus balticus, and to the lakeward side is the closed lake basin meadow of Hordeum jubatum - Glaux maritima - Muhlenbergia asperifolia - Sonchus arvensis - Atriplex prostrata
habitat:	David Lake drawdown basin nearshore subxeric alkaline sand supporting semiclosed to semiopen graminoid meadow of 5-20% Glaux maritima - SOIL (alkaline sand) - LITTER; 1-5% **Aster pauciflorus** - Muhlenbergia asperifolia - Juncus balticus - Carex parryana; <1% Agropyron trachycaulum subsp. subsecundum - Potentilla anserina - Hordeum jubatum - Puccinellia nuttalliana - Ranunculus cymbalaria - Aster ericoides - Agropyron trachycaulum subsp. trachycaulum - Sonchus uliginosus

map/date site: **Ap4 – Astepau-020815e**
location: Wainwright Dunes Ecological Reserve; north shore of David Lake, 1 km NE of peninsula's southern tip, about 130 m SSE to eastern boundary entrance gate; NE9-2-42-5W4; see figure and map Ap4
lat./long.: (centre) 52°35.372'N / 110°36.346'W (0.025') (GPS)
UTM27: (centre) 12N 0527700E 5826470N (30m) (GPS)
collection: none
photo: none
plant numbers: single plant counted in 0.1 m X 0.2 m area
note: situated 3 m from nearshore meadow and 25 m from closed backshore low thicket
habitat: drawdown lake nearshore subhygric sand plain with closed shore shrubby graminoid successional meadow of LOW SHRUBS (semiopen) Salix petiolaris (10%) – Betula occidentalis (8%); HERBS (closed to semiclosed) 5–20% LITTER – Juncus balticus – Potentilla anserina – Carex scirpoidea; 1–5% Agropyron trachycaulum subsp. subsecundum – Senecio pauperculus; <1% Cirsium flodmanii – Crepis runcinata – Solidago canadensis – Equisetum arvense – **Aster pauciflorus**

map/date site: **Ap5 – Astepau-020817a-i**
location: Wainwright Dunes Ecological Reserve; N side of David Lake, 600 m NNE of peninsula's southern tip, NE10-2-42-5W4; see figure and map Ap5
lat./long.: (centre) 52°35.276'N / 110°36.718'W (0.025') (GPS)
UTM27: (centre) 12N 0526290E 5826260N (30m) (GPS)
collection: none
photo: none
plant numbers: 1 plant counted in 1 m X 1 m area; in mid-flower
note: associated with Carex parryana (020817c); 85 m off mid-portion of grove, half way to berm
habitat: drawdown lake offshore subhygric alkaline sand with semiclosed grazed meadow of 20–50% SOIL (sand); 5–20% LITTER – Glaux maritima; 1–5% Agropyron trachycaulum subsp. trachycaulum – Potentilla anserina – **Aster pauciflorus**; <1% Juncus balticus – Puccinellia nuttalliana – Carex parryana

map/date site: **Ap6 – Astepau-020817a-ii**
location: Wainwright Dunes Ecological Reserve; N side of David Lake, 600 m NNE of peninsula's southern tip, NE10-2-42-5W4; see figure and map Ap6
lat./long.: (centre) 52°35.247'N / 110°36.711'W (0.025') (GPS)
UTM27: (centre) 12N 0526295E 5826231N (30m) (map)

collection: none
photo: none
plant numbers: 1 plant counted in 0.1 m X 0.2 m area with mature inflorescences in mid-flower
note: 122 m off middle grove, half way to berm
habitat: drawdown lake offshore subhygric alkaline sand with semiclosed grazed meadow of 20–50% LITTER – SOIL (sand) – Glaux maritima; 5–20% Agropyron trachycaulum subsp. trachycaulum – Sonchus uliginosus; 1–5% Juncus balticus – Potentilla anserina; <1% **Aster pauciflorus**

map/date site: Ap7 – Astepau-020817a-iii
location: Wainwright Dunes Ecological Reserve; N side of David Lake, 500 m NNE of peninsula's southern tip, NE10–2–42–5W4; see figure and map Ap7
lat./long.: (centre) 52°35.227'N / 110°36.723'W (0.025') (GPS)
UTM27: (centre) 12N 0526284E 5826194N (30m) (GPS)
collection: none
photo: none
plant numbers: 1 plant counted in 0.1 m X 0.2 m area with mature inflorescences at mid-flowering
note: 125 m off SW end of grove
habitat: drawdown lake offshore subhygric alkaline sand with semiclosed grazed meadow of 20–50% Glaux maritima – SOIL (sand); 5–20% LITTER – Potentilla anserina – Agropyron trachycaulum subsp. trachycaulum; 1–5% Juncus balticus – **Aster pauciflorus**

map/date site: Ap8 – Astepau-020817a-iv
location: Wainwright Dunes Ecological Reserve; N side of David Lake, 500 m NNE of peninsula's southern tip, NE10–2–42–5W4; see figure and map Ap8
lat./long: (centre) 52°35.272'N / 110°36.666'W (0.025') (GPS)
UTM27: (centre) 12N 0526347E 5826271N (30m) (GPS)
collection: none
photo: none
plant numbers: 14 plants counted in 1 m X 3 m area; with inflorescences at mid-flowering
note: associated with Muhlenbergia asperifolia (see 020817b); 150 m off NE end of grove, 3/4 way to berm
habitat: drawdown lake offshore subhygric alkaline sand with semiclosed grazed meadow of 50–75% LITTER; 20–50% SOIL (sand); 5–20% Potentilla anserina; 1–5% Glaux maritima – **Aster pauciflorus** – Agropyron trachycaulum subsp. trachycaulum; <1% Juncus balticus – Hordeum jubatum –

Muhlenbergia asperifolia

map/date site: **Ap9 - Astepau-020817a-v**
location: WDE; N side of David Lake, 500 m NNE of peninsula's southern tip, SE10-2-42-5W4; see figure and map Ap9
lat./long.: (centre) 52°35.298'N / 110°36.654'W (0.025') (GPS)
UTM27: (centre) 12N 0526361E 5826329N (30m) (GPS)
collection: 020817a1 (1 replicate @ PP-4864 / root / stem: procumbent, 20 cm / leaf: full / inflorescence: submature / flower: buds 95%, mature 5%)
photos: N18 (general habitat: drawdown lake offshore, grazed, see Carex parryana) N19 (general habitat: drawdown lake offshore, grazed) N20 (habitat detail: drawdown lake offshore, note Potentilla anserina)
plant numbers: 8 plants counted in 3 m X 18 m area; with mature inflorescence at mid-flowering
note: 3/5 way from NE end of aspen grove and bend in the berm chain
habitat: drawdown lake offshore subhygric alkaline sand with semiclosed grazed meadow of 20-50% Potentilla anserina - Glaux maritima; 5-20% LITTER - SOIL (sand) - Agropyron trachycaulum subsp. trachycaulum; 1-5% Juncus balticus - Sonchus uliginosus; <1% Ranunculus cymbalaria - **Aster pauciflorus**

map/date site: **Ap10 - Astepau-020817b-iii**
location: Wainwright Dunes Ecological Reserve; N side of David Lake, 500 m NNE of peninsula's southern tip, about 35 m off the SW end of the aspen grove on the backshore; SE10-2-42-5W4; see map Ap10
lat./long.: (centre) 52°35.230'N / 110°36.695'W (0.025') (GPS)
UTM27: (centre) 12N 0526309E 5826200N (30m) (GPS)
collection: none
photo: N21 (habitat detail: drawdown lake offshore alkaline meadow)
plant numbers: 3 plants counted in 5 m X 5 m area; several in mature inflorescence
note: associated with Muhlenbergia asperifolia (see 020817b); see figure for locations
habitat: David Lake backshore moist meadow, some seepage evident with semiclosed graminoid meadow of 20-50% LITTER - SOIL (alkaline) - Muhlenbergia asperifolia - Glaux maritima; 5-20% Potentilla anserina - Hordeum jubatum; 1-5% Agropyron trachycaulum subsp. subsecundum - Juncus balticus; <1% **Aster pauciflorus**

map/date site: **Ap11 - Astepau-020818a**
location: Wainwright Dunes Ecological Reserve; northwestern side of David Lake,

100 m SSE of peninsula's southern tip; NW2-2-42-5W4; see figure and map Ap11

lat./long.: (centre) 52°34.973'N / 110°36.893'W (extends between 52°34.997'N / 110°36.868'W on NE side and 52°34.980'N / 110°36.904'W on SW side) (0.025') (GPS)

UTM27: (centre) 12N 0526094E 5825723N (extends between 12N 0526123E 5825768N on NE end, and 12N 0526082E 5825736N on SW end) (30m) (GPS)

collection: 020818a1 (habitat 2 / 2 replicates @ UAC ALTA / root / rhizome / stem: full, 18 cm / leaf: full / culm: full, 18 cm / flower: bud 10%, young 20%, mature 70%)

photos: P4 (habitat detail: drawdown lake offshore, alkaline barrens, Aster pauciflorus in flower, scale to ruler) P5 (habitat detail: drawdown lake offshore, very open alkaline barrens) P6 (habitat detail: drawdown lake offshore, semiopen meadow, with Muhlenbergia asperifolia & Carex parryana, scale to ruler) P7 (drawdown lake offshore, tall meadow habitat, scale to ruler), P8 (habitat detail: drawdown lake offshore, alkaline open sand in grazed Juncus balticus sward)

plant numbers: 521 plants counted in 10 groups in 45 m X 110 m area; habitat 3 includes one group with 380 plants in 12 m X 18 m area; 85% in mature inflorescence with young to mature flowers

note: with Muhlenbergia asperifolia (020818b) and Carex parryana (020818c); essentially flat and level; much wetter during high lake level periods; habitat 1 continuous with backshore meadow zone

habitat 1: drawdown lake nearshore subhygric to mesic alkaline sand with very open to open meadow of 20-50% SOIL (alkaline sand); 5-20% LITTER - Glaux maritima - Scirpus pungens; 1-5% Juncus balticus - Sonchus uliginosus - Muhlenbergia asperifolia - Astepau-- Potentilla anserina - Antennaria pauciflora - Ranunculus cymbalaria - Aster ericoides; <1% Solidago canadensis

habitat 2: drawdown lake nearshore subhygric to mesic alkaline sand with very open to open meadow of 20-50% LITTER - SOIL (alkaline sand); 5-20% Scirpus pungens - Glaux maritima - Juncus balticus; 1-5% Potentilla anserina - Antennaria pauciflora - Muhlenbergia asperifolia - Aster ericoides - Sonchus uliginosus; <1% **Aster pauciflorus** - Potentilla pensylvanica - Carex (species) - Carex parryana - Cirsium flodmanii

habitat 3: drawdown lake offshore subhygric to mesic alkaline sand with extremely open meadow of 50-75% SOIL (alkaline sand); 1-5% Muhlenbergia asperifolia - **Aster pauciflorus** - LITTER - Puccinellia nuttalliana - Glaux maritima - Scirpus pungens - Agropyron trachycaulum subsp.

subsecundum – Juncus balticus; <1% Hordeum jubatum – Distichlis stricta – ?Suaeda calceoliformis – Aster ericoides

Photos: Photographs of habitats and plant locations for *Aster pauciflorus* in the Wainwright Dunes Ecological Reserve

- Ap3—Astepau-020815a
    - N1 (general habitat: drawdown lake offshore, looking N)
    - N2 (general habitat: drawdown lake offshore, looking E at backshore thicket fringe)
    - N3 (habitat detail: drawdown lake offshore ground cover, scale to ruler)
    - N4 (habitat detail: drawdown lake offshore ground cover, scale to ruler)
    - N5 (general habitat: drawdown lake offshore, looking NE toward backshore thicket fringe, with Muhlenbergia asperifolia & Carex parryana)
    - N17 (general habitat: drawdown lake offshore, looking NE toward backshore thicket fringe, with Muhlenbergia asperifolia & Carex parryana)
    - N18 (general habitat: drawdown lake offshore, looking NE toward backshore thicket fringe, with Muhlenbergia asperifolia & Carex parryana)
    - O19 (plant detail: plant growth habit)
    - O20 (plant detail: plant growth habit)
    - O21 (plant detail: inflorescence and flower)
    - O22 (plant detail: inflorescence and flower)
    - O23 (plant detail: inflorescence and flower)

- Ap9—Astepau-020817a-v
    - N18 (general habitat: drawdown lake offshore, grazed, see Carex parryana)
    - N19 (general habitat: drawdown lake offshore, grazed)
    - N20 (habitat detail: drawdown lake offshore, note Potentilla anserina)
    - Ap10—Astepau-020817b-iii
    - N21 (habitat detail: drawdown lake offshore alkaline meadow)

- Ap11—Astepau-020818a
    - P4 (habitat detail: drawdown lake offshore, alkaline barrens, Aster pauciflorus in flower, scale to ruler)
    - P5 (habitat detail: drawdown lake offshore, very open alkaline barrens)
    - P6 (habitat detail: drawdown lake offshore, semiopen meadow, Aster pauciflorus in flower, with Muhlenbergia asperifolia & Carex parryana, scale to ruler)
    - P7 (drawdown lake offshore, tall meadow habitat, scale to ruler)
    - P8 (habitat detail: drawdown lake offshore, alkaline open sand in grazed Juncus

balticus sward)

Shinnersoseris rostrata (A. Gray) S. Tomb—**annual skeletonweed**—***ASTERACEAE***

This annual, low herb of sandy bank, dunes and loose sand habitats has a provincial Rank of **S2** in Alberta, and a global Rank of **G5?** (Vujnovic & Gould 2002, ANHIC 2002). *Shinneroseris rostrata* has erect, slightly branching stems, which in the Reserve grow to a height of about 25 cm. It has slightly arching and soft, linear, three-veined, sessile, glaucous leaves that are 5 cm to 20 cm long. Its inflorescence forms a relatively flat-topped, open panicle with pink ray flowers in an involucre of a cluster of very small, acuminate-ovate bracts at the base of seven to nine, 10 mm to 16 mm long, linear bracts, and it produces achenes that have a white, non-plumose pappus. This species was formerly called *Lygodesmia rostrata* A. Gray, and its nearest relative is another member of that genus, *Lygodesmia juncea* (Pursh) D. Don (skeletonweed), which invariably occurred with this species, and may be somewhat similar on first viewing (Moss 1983, Scoggan 1979). However, the *Lygodesmia juncea* differed in being a much more sprawling plant, growing as a perennial by a rhizome, with stiff, straight to only slightly arching, subulate (awl-shaped) leaves that also are glaucous but rarely attain 5 cm in length, a more diffuse inflorescence that frequently is not a well-defined panicle, with an involucre of small basal bracts that are more narrowly acute, and with only five linear larger bracts, and a sap that is notably yellow rather than white. Another provincially rare, pink-flowered, paniculate, erect plant with which it may be confused is *Stephanomeria runcinata,* which is limited to the Grassland Natural Region in the province. It differs in being a perennial, having backward-pointing teeth on the leaves, and having a distinctly plumose pappus atop the achene. As well, drought-stressed, stunted plants of the more common *Lactuca pulchella* could be mistaken for the species, but differed from these by typically having blue flowers with an even gradation in bract sizes in the involucre. In seeking these plants in their habitat, their presence also frequently was obscured due to their resemblance to the glaucous leaf colour and similar leaf projection angles and lengths of the common sand dune grass, *Calamovilfa longifolia;* so a careful examination in their potential habitat is warranted.

The species occurs in central western North America from the southern parts of the prairie provinces southward toward Texas and into Mexico. It is rare in Alberta, Saskatchewan and Manitoba, and three of the northern midwestern states (NatureServe 2003, Kershaw *et al.* 2001). In Alberta it has 11 known locations along the eastern side in the Grassland and Parkland Natural Regions of the province, with two known stations in the general vicinity of Wainwright (ANHIC 2003). It was initially recorded from the northeastern portion of the Wainwright Dunes Ecological Reserve by Cottonwood Consultants, Ltd. (1986), and was later collected by Derek Johnson in 1992; their records were repeated in the Reserve's management plan (Anon 1998). The 2002 survey of the Reserve refound at least one of the Cottonwood's general locations, and added four general clusters, all within the Reserve's boundaries: 1.8 km west of David Lake, 1 km northwest of the lake, and 2.5 and 3 km north northwest of David Lake. The UTM grid location cited by Johnson in 1992 that appeared in the ANHIC Element Occurrence data sheet was relocated and surveyed, but no typical habitat for the species was discovered (see map Sr3).

These five clusters supported 18 sampled species locations that typically varied in size from 1.5 m X 2 m to 4 m X 35 m, and had numbers of plants ranging between 2 and 20 plants, although in one case a 2 m X 4 m area held 60 plants, and in another there were 15 plants spread over an 8 m X 75 m area. The total number of plants of this species discovered within the Ecological Reserve's boundaries was 257 individuals. The plants appeared to have been greatly affected by the prolonged drought conditions, and were producing well-developed inflorescences by mid- to late July, with successful fruit production by mid- to late August, and possibly into early or mid-September. The inflorescences of virtually all the examined plants continuously produced both flowers and fruits between at least a six to eight week period after mid-July, and in all probability each plant had the capability of producing over 50 viable seeds. Since this species is an annual, the current year's plants would disappear at the end of the season, and the limiting factor in establishing the following year's populations through seed germination may well be the presence of rainfall, as well as the deposition of the seeds on suitable sandy habitat. Nevertheless, with the 2002 growing season was markedly devoid of rainfall with only rare cloudburst downpours or very brief, transient light rains. Nevertheless, such moisture conditions apparently were sufficient for the species to have become reestablished at many of the potential sites examined during the project.

The prime habitat for this species within the Ecological Reserve was the subxeric to xeric, semiopen sand of the southwest-facing, semiactive to active erosion faces on the upper to middle slopes and draws along the sand dune ridge blowout basins. The associated community here was composed of *Calamovilfa longifolia, Stipa curtiseta, Koeleria macrantha, Carex pensylvanica* var. *digyna, Elymus canadensis (Canada wild rye), Oryzopsis hymenoides, Sporobolus cryptandra, Carex obtusata, Carex siccata, Carex praegracilis, Lygodesmia juncea, Festuca saximontana, Helianthus couplandii, Heterotheca villosa* and others, including the provincially rare *Cyperus schweinitzii* and *Chenopodium leptophyllum*. In may instances the plants occurred along the uppermost reaches of the erosion face slope, but also extended locally toward, but only barely into, the low thickets that were fringing the dune ridge crests. Here the associated species included *Prunus virginiana, Juniperus communis, Rosa acicularis, Calamovilfa longifolia, Rhus radicans* var. *rydbergii (poison ivy)* and others, as well as *Lygodesmia juncea*, which often formed a diffuse tangle that obscured the presence of the plants. In only one instance did it occur in the lower slope of a semiactive to semistable blowout basin, with an associated community dominated by *Cyperus schweinitzii*.

The main habitat threat to this species probably is the prolonged drought conditions in the region, although it appears to have been successful in surviving the drought of the past several years. Erosion and deposition from blowing sand may remove the seed bank from suitable germination sites, and in only one instance was a current population immediately in danger of being buried in actively depositing dune sand. Cattle grazing was not evident in any of the sites examined, but one dune ridge in the western portion of the reserve did have some evidence of an all terrain vehicle ("quad") using the sandy slopes for unauthorized travel.

The management considerations for this species should include monitoring the known populations in order to establish what the regeneration success might be from the previous years' seed production. Since this is an annual, but apparently with a good potential for seed production and apparently an ability to germinate readily, such monitoring would be valuable in realizing further management actions required to preserve the species. Additionally, there likely are more populations in the semiactive sand dune ridge blowout situations elsewhere within the Reserve, and further surveying probably would be fruitful. The infringement of all terrain vehicle traffic on the sand dune ridge blowouts should be actively discouraged, so as to protect this sensitive and significant habitat.

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Ecological Land Survey Site Description and ANHIC Rare Native Plant Report Information for *Shinneroseris rostrata* in the Wainwright Dunes Ecological Reserve

ECOLOGICAL LAND SURVEY SITE DESCRIPTION

Exposure Type	wind (2), insulation (3)
Flood Hazard	not apply
Soil Drainage	rapidly drained (2)
Perviousness	rapidly (1)
Site: Macro	not apply
Site: Meso	upper slope (2), mid-slope (3), lower slope (4)
Site: Micro	straight (1)
Site: Surface Shape	concave (2)
Ecological Moisture Regime	very xeric (1), xeric (2)
Nutrients	?submesotrophic (2)
Successional Status: 1	pioneer (1)
Successional Status: 2	not apply
Disturbance Factors	not apply

ANHIC RARE NATIVE PLANT REPORT

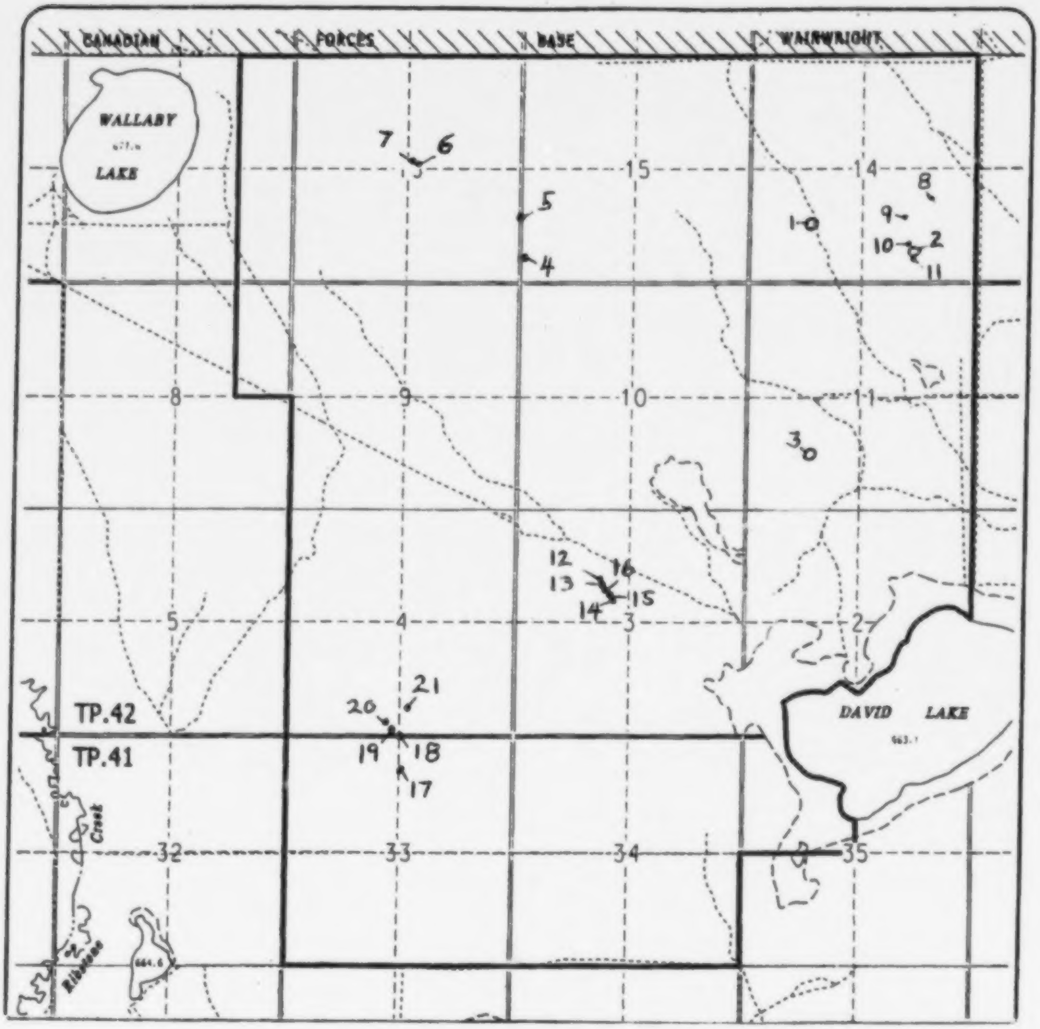
Phenology: vegetative	mid-July
Phenology: reproductive – inflorescence	early to mid- to late August, early September
Phenology: reproductive – flower	early to mid- to late August, to early September
Phenology: reproductive – fruit	mid- to late August, to early to mid-September
Habitat Threats	wind erosion, grazing
Management Considerations	monitoring populations and drought impacts

Species Locations Summary for *Shinneroseris rostrata* in the Wainwright Dunes Ecological Reserve

map site/date site	location coordinates	number (size)	habitat
Sr1 – Shinros-86xxxxa	52°36.500'N 110°37.260'W	no information	sand dune blowout
Sr2 – Shinros-86xxxxb	52°36.200'N 110°36.600'W	no information	sand dune blowout
Sr3 – Shinros-920729a	UTM27 526400E 5827450N	no information	well drained sand dune
Sr4 – Shinros-020715d	52°36.614'N 110°39.051'W	18 (1.5m X 7m)	dune ridge blowout upper slope
Sr5 – Shinros-020716e	52°36.671'N 110°39.091'W	17 (1.6m X 2.3m)	dune ridge blowout upper slope
Sr6 – Shinros-020716f	52°36.964'N 110°39.789'W	6 (4m X 30m)	dune ridge blowout upper slope
Sr7 – Shinros-020716h	52°36.970'N 110°39.795'W	12 (5m X 30m)	dune ridge blowout upper slope
Sr8 – Shinros-020718c	52°36.850'N 110°36.440'W	15 (8m X 75m)	dune ridge blowout upper slope
Sr9 – Shinros-020718e	52°36.724'N 110°36.659'W	5 (3.5m X 5m)	dune ridge blowout slope
Sr10 – Shinros-020718f	52°36.695'N 110°36.630'W	13 (3m X 4m)	dune ridge blowout slope
Sr11 – Shinros-020718g	52°36.667'N 110°36.604'W	3 (1m X 20m)	dune ridge blowout slope
Sr12 – Shinros-020719f	52°35.382'N 110°38.576'W	50 (8m X40m)	dune ridge blowout slope
Sr13 – Shinros-020719g	52°35.363'N 110°38.548'W	5 (1m X 5m)	dune ridge blowout slope
Sr14 – Shinros-020719h	52°35.375'N 110°38.534'W	8 (3m X 7m)	dune ridge blowout slope
Sr15 – Shinros-020719i	52°35.339'N 110°38.519'W	2 (0.3m X 1.5m)	dune ridge blowout slope
Sr16 – Shinros-020719k	52°35.345'N 110°38.534'W	6 (1.5m X 2m)	dune ridge blowout slope
Sr17 – Shinros-020816b	52°34.683'N 110°39.955'W	10 (4m X 20m)	dune ridge blowout slope
Sr18 – Shinros-	52°34.871'N 110°39.659'W	6	dune ridge blowout

map site/date site	location coordinates	number (size)	habitat
020816f		(5m X 30m)	slope
Sr19 – Shinros-020816h	52°34.756'N 110°40.002'W	2 (0.5m X 0.5m)	dune ridge blowout slope
Sr20 – Shinros-020816i	52°34.770'N 110°40.054'W	60 (2m X 4m)	dune ridge blowout slope
Sr21 – Shinros-020816j	52°34.783'N 110°40.087'W	19 (2m X 12m)	dune ridge blowout slope

Map: Species locations for *Shinneroseris rostrata* in the Wainwright Dunes Ecological Reserve (o indicates approximate reported locations)


CANADIAN
FORCES
BASE
WAINWRIGHT
WALLABY LAKE
DAVID LAKE
TP.42
TP.41
Ribstone
Creek
7
6
5
4
1-o
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32
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34
35

Photo: *Shinneroseris rostrata* (annual skeletonweed) plant detail: growth habit with flowering inflorescence (Sr17—Shinros-020816b—08, photo Ian D. Macdonald)

PREVIOUSLY REPORTED SPECIES LOCATIONS

map/date site: **Sr1 - Shinros-86xxxxa**
location: Wainwright Dunes Ecological Reserve // 5 km NW of David Lake peninsula (see comment below) // see map Sr1
source: Cottonwood Consulting, Ltd. 1986.
reference: Cottonwood Consulting, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton.
observation: C. Wallis 1985
collection: no information
photo: no information
plant numbers: no information
note: none
habitat: sand dune blowout
comment: population not relocated in 2002; vicinity of SW14-42-5W4; approximately 52°36.500'N /110°37.260'W; about 3 km N of the David Lake peninsula's southern tip

map/date site: **Sr2 - Shinros-86xxxxb**
location: Wainwright Dunes Ecological Reserve // about 3 km NNW of David Lake (see comment below) // see map Sr2
source: Cottonwood Consulting, Ltd. 1986.
reference: Cottonwood Consulting, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton.
observation: —
collection: no information
photo: no information
plant numbers: no information
note: none
habitat: sand dune blowout
comment: population not relocated in 2002; NE2-15-42-5W4; approximately 52°36.200'N / 110°36.600'W; 3.3 km NNE of the David Lake peninsula's southern tip

map/date site: **Sr3 - Shinros-920729a**
location: adjacent to Wainwright Dunes Ecological Reserve // (north of) David Lake (see below) // UTM27 526400E 5827450N // see map Sr3
source: ANHIC // Element Occurrence PDAST8J010 # 001

reference: —
observation: J.D. Johnson 1992. (field notes) // specimen source code S92JOHCFABCA04
collection: Johnson, J.D. 1992-07-29 // CF# 930282 // ID-OK
photo: —
plant numbers: no information
note: —
habitat: well drained sand dune // 685 m
comment: population not relocated in 2002; 1.6 km NNW of the David Lake peninsula's southern tip; specimen not examined

RECENTLY DISCOVERED SPECIES LOCATIONS

map/date site: Sr4 - Shinros-020715d
location: Wainwright Dunes Ecological Reserve; 3.8 km NW of the David Lake peninsula's southern tip; SW4-15-42-5W4; see figure and map Sr4 lat./long.: (centre) 52°36.614'N / 110°39.051'W (0.025') (GPS)
collection: 020715d1 (1 replicate @ ALTA / root / stem: 12 cm / inflorescence: 8 cm / flower: bud 90%, young 10%, mature 10%, old 0%)
photo: H5 (plant detail: growth habit, note inflorescence with less than 10% open flowers) H6 H7 (flower detail: single flowers) H8 (detail habitat: sand dune blowout slope, plants in upper half of blowout habitat) H9 (general habitat: sand dune blowout slope, plants in upper half of blowout habitat, pink flags mark plants)
plant numbers: 18 plants counted in 1.5 m X 7 m area; plants extend 2/5 to 2/3 up erosion slope from base
note: associated with Cyperus schweinitzii; much Lygodesmia juncea along crest of ridge, just above the Shinneoseris rostrata population, and care taken to not confuse it with the Shinneroseris rostrata plants
habitat: sand dune ridge semiactive blowout slope (18° toward 200° to 220° - SW) with open xeric semiactive sand barrens of 50-75% SOIL (sand); 5-20% Calamovilfa longifolia; 1-5% LITTER - Stipa curtiseta; <1% Elymus canadensis - Helianthus couplandii - Carex obtusata - Cyperus schweinitzii - Salix lutea - Lygodesmia juncea - **Shinneroseris rostrata**

map/date site: Sr5 - Shinros- 020716e
location: Wainwright Dunes Ecological Reserve; 4 km NW of the David Lake peninsula's southern tip; SE8-16-42-5W; see figure and map Sr5 lat./long.: (centre) 52°36.671'N / 110°39.091'W (0.025') (GPS)

collection: 020716e1 (1 replicate @ ALTA / root / stem: 8 cm / inflorescence: 2/3 grown, 15 cm / flower: bud 80%, young 15%, mature 15%, old 0%)

photos: G5 G6 G8 (panorama series of general habitat, flags marking population boundaries) G9 (see Cyperus schweinitzii for dune slope habitat detail) G10 G11 G12 (dune base habitat detail)

plant numbers: 17 plants counted in 1.6 m X 2.3 m area; all plants have inflorescences with 5% at midflowering stage; plants single or in groups of four

note: associated with Cyperus schweinitzii (020716d); plants at lower slope face; leaves have blue-green tone and the leaf angle of the Calamovilfa; see figure

habitat: sand dune ridge blowout slope (40° toward 170° - SSE) with very open xeric sand barrens of 50-75% LITTER - SOIL (sand); 5-20% Calamovilfa longifolia; 1-5% Cyperus schweinitzii - Carex siccata - Carex pensylvanica var. digyna; <1% Chenopodium praegracilis - **Shinneroseris rostrata** - Helianthus couplandii - Lygodesmia juncea

map/date site: **Sr6 - Shinros-020716f**

location: Wainwright Dunes Ecological Reserve; 4.8 km NW of the David Lake peninsula's southern tip; SW10-16-42-5W4; see figure and map Sr6 lat./long.: (SE end) 52°36.964'N / 110°39.789'W (0.025') (GPS)

collection: none

photo: (see also photos for Cyperus schweinitzii); G12 G13 G14 G15 G16 (general habitat: panorama series (right to left), sand dune blowout basin and slope, pink flags mark upper and lower plant boundaries) G17 (habitat detail: sand dune blowout basin)

plant numbers: 6 plants counted in 4 m X 30 m area; all in inflorescence with young to submature flowers and early fruit; marked by pink ribbon on aspen

note: associated with Cyperus schweinitzii; also with dry habitat form of Carex lanuginosa (not C. houghtoniana); this may be the same location as that of Wallis' record for Carex houghtoniana (see Sr3 above)

habitat: sand dune ridge (7 m tall) semiactive unstable blowout slope erosion face (24° to 40° toward 240° - WSW) with xeric sand barrens of 50-75% SOIL (sand); 5-20% LITTER - Calamovilfa longifolia - Carex pensylvanica var. digyna; 1-5% Cyperus schweinitizii - Carex lanuginosa (note); <1% Koeleria macrantha - Stipa curtiseta - Carex siccata - Carex obtusata - **Shinneroseris rostrata** - Lygodesmia juncea

map/date site: Sr7 – Shinros-020716h

location: Wainwright Dunes Ecological Reserve; 4.9 km NW of the David Lake peninsula's southern tip; SW10-16-42-5W4; see map Sr7
lat./long.: (SE end) 52°36.970'N /110°39.795'W (0.025') (GPS)

collection: none

photos: H14 H15 (plant detail: growth habit with inflorescence) G21 (general habitat: sand dune semiactive blowout) G22 (habitat detail: sand dune semiactive blowout, scale to ruler between 2 plants)

plant numbers: 12 plants counted in two proximate locations 30 m apart: 11 in 0.7 m X 2.5 m area and 1 in 0.1 m X 0.1 m area, all with inflorescences and about 10% midflowering; no wilting noted in spite of the extreme heat

note: associated with Cyperus schweinitzii (020716h)

habitat: 7 m tall sand dune ridge semiactive unstable blowout erosion slope crest (32° to 38° toward 200° – SSW) with very dry open to very open sand barrens of 50–75% SOIL (sand); 5–20% Carex pensylvanica var. digyna; 1–5% LITTER – Calamovilfa longifolia – Cyperus schweinitizii; <1% **Shinneroseris rostrata** – Oryzopsis hymenoides – Prunus virginiana – Lygodesmia juncea – Lithospermum incanum

map/date site: Sr8 – Shinros-020718c

location: Wainwright Dunes Ecological Reserve; 3.5 km N of the David Lake peninsula's southern tip; NW8-14-42-5W4; see figure and map Sr8
lat./long.: (centre) 52°36.850'N / 110°36.440'W (between 52°36.835'N / 110°36.428'W on E end and 52°36.871'N / 110°36.464'W on W end) (0.025') (GPS)

collection: 020718c1 (1 replicate @ UAC / root / stem: 15 cm / inflorescence: 18 cm – total 25 cm/ flower: bud 90%, young 5%, mature 5%, old 0%)

photos: H20 H21 H22 (plant detail: growth habit, scale to ruler) H23 (Lygodesmia juncea, growth habit: scale to ruler, note rambling stem growth and shorter leaves) H24 H25 (plant detail: growth habit of Shinneroseris rostrata compared with Lygodesmia juncea) I15 (general habitat: dune ridge blowout, looking north, eastern plant locations marked by pink flags at centre of photo) I16 (general habitat: dune ridge blowout, western plant locations marked by pink flags, note coyote den) I17 (detail habitat: dune ridge blowout, western plant locations, scale to ruler)

plant numbers: 15 plants counted in two groups 75 m apart: E site with 10 plants in 1.5 m X 6 m area, W site with 5 plants in 2 m X 8 m area; all with inflorescences having over 25% mature flowers; plants with vigorous growth

note: aspen grove along dune ridge backslope with choke cherry adjacent to E site and open sand with grassland to W; active coyote den at W site; marked by pink tape on choke cherry at blowout rim

habitat: sand dune ridge slope (18° to 23° toward 190 to 217° – SSW to SW) of semistable old blowout slope crest with xeric sand grassland of 50–75% SOIL (sand); 20–50% LITTER; 5–20% Carex pensylvanica var. digyna – Calamovilfa longifolia; 1–5% Koeleria macrantha – Lygodesmia juncea; <1% Carex obtusata – **Shinneroseris rostrata** – Stipa curtiseta – Helianthus couplandii – Erysimum asperum – Heterotheca villosa – Elymus canadensis – Prunus virginiana

map/date site: Sr9 – Shinros-020718e

location: Wainwright Dunes Ecological Reserve; 3.3 km N of the David Lake peninsula's southern tip; SE7–14–42–5W; see figure and map Sr9 lat./long.: (centre) 52°36.724'N / 110°36.659'W (0.025') (GPS)

collection: none

photos: I19 (general habitat: sand dune semiactive blowout, looking east, flags mark plant locations) I20 (general habitat: sand dune semiactive blowout, looking west, flags mark plant locations) I21(habitat detail: sand dune semiactive blowout crest, flags mark plant locations)

plant numbers: 5 plants counted in 3.5 m X 5 m area; all with inflorescences with 25% mature flowers; plants somewhat small

note: plants growing among Lygodesmia juncea; recent erosion on adjacent slope face;

habitat: upper third of sand dune ridge semiactive blowout erosion slope (32° toward 160° – SSE) with open to very open xeric sand barrens of 50–75% LITTER – SOIL (sand); 1–5% Calamovilfa longifolia – Koeleria macrantha – Lygodesmia juncea – Prunus virginiana; <1% Juniperus horizontalis – **Shinneroseris rostrata** – Erysimum asperum – Helianthus couplandii – Rhus radicans var. rydbergii – Elymus canadensis

map/date site: Sr10 – Shinros-020718f

location: Wainwright Dunes Ecological Reserve; 3.3 km N of the David Lake peninsula's southern tip; NE2–14–42–5W4; see figure and map Sr10 lat./long.: (centre) 52°36.695'N / 110°36.630'W (0.025') (GPS)

collection: none

photos: I22 (general habitat: sand dune with active blowout deposition adjacent to population, looking west, flags mark plant locations) I23 (habitat detail: sand dune with active blowout deposition adjacent to population, flags mark plant locations)

plant numbers: 13 plants counted in 3 m X 4 m area; all with inflorescences in early to mid flowering

note: sand deposition from NW side will eventually bury or reduce site

habitat: sand dune ridge semiactive blowout slope (12° toward 165° - SSE) with semiopen xeric sand barrens of 50-75% SOIL (sand); 5-20% Koeleria macrantha - Carex pensylvanica var. digyna; 1-5% LITTER - Calamovilfa longifolia - Stipa curtiseta - Prunus virginiana; <1% Lygodesmia juncea - **Shinneroseris rostrata** - Oryzopsis hymenoides - Elymus canadensis

map/date site: Sr11 - Shinros-020718g

location: Wainwright Dunes Ecological Reserve; 3.2 km N of the David Lake peninsula's southern tip; SE2-14-42-5W4; see figure and map Sr11 lat./long.: (centre) 52°36.667'N / 110°36.604'W (0.025') (GPS)

collection: none

photo: J0 (plant detail: growth habit with inflorescence)

plant numbers: 3 plants counted in 1 m X 20 m area; all with inflorescences in early to mid-flowering

note: marked by pink tape 30 m @ 304° to population; this to north and adjacent to above population (020718f - Sr10)

habitat: sand dune ridge uppermost slope (42° toward 210° - SSW) of semistable old blowout with semiopen to open xeric sand barrens of 50-75% SOIL (sand); 5-20% LITTER; 1-5% Calamovilfa longifolia - Stipa curtiseta - Koeleria macrantha - Lygodesmia juncea - Prunus virginiana; <1% Carex pensylvanica var. digyna - Carex obtusata - **Shinneroseris rostrata** - Chenopodium pratericola

map/date site: Sr12 - Shinros-020719f

location: Wainwright Dunes Ecological Reserve; 2 km NW of the David Lake peninsula's southern tip; NE11-3-42-5W4; see figure and map Sr12 lat./long.: (centre) 52°35.382'N / 110°38.576'W (0.025') (GPS)

collection: 020719f1 (1 replicate @ ALTA / root / stem: 12 cm / inflorescence: 15 cm / leaf: full / flower: bud 75%, young 10%, mature 10%, old 5% / fruit: none / old stem of 2001 plant)

photos: J6 (habitat detail: sand dune blowout crest with several vigorous plants) J7 J8 (plant detail: growth habit on slope) K8 (general habitat: sand dune blowout slope, pink flags mark plant locations) K9 (general habitat: sand dune blowout slope crest, pink flags mark plant locations) K10 (general habitat: sand dune blowout basin and slope, pink flags mark plant boundary)

plant numbers: 50 plants counted in five groups in 8 m X 40 m area; all with inflorescences in late flowering to early to mid-fruiting; plants from one-third to two-thirds up the blowout slope above the erosion face

note: associated with Cyperus schweiinitzii (020719g); choke cherry thicket above blowout crest; marked by pink ribbon on birch in blowout basin 12 m @ 40° to plants; also site of Lycopodium clavatum var. monostachyon

habitat: sand dune ridge with active to semiactive blowout slope (22° toward 195° - SSW) supporting open xeric sand barrens of 50-75% SOIL (sand); 20-50% LITTER; 5-20% Calamovilfa longifolia; 1-5% Carex pensylvanica var. digyna - Lygodesmia juncea - **Shinneroseris rostrata**; <1% Helianthus couplandii - Stipa curtiseta - Carex siccata - Koeleria macrantha - Oryzopsis hymenoides - Elymus canadensis

map/date site: Sr13 - Shinros-020719g

location: Wainwright Dunes Ecological Reserve; 2 km NW of the David Lake peninsula's southern tip; NE11-3-42-5W4; see figure and map Sr13 lat./long.: (centre) 52°35.363'N / 110°38.548'W (0.025') (GPS)

collection: none

photos: see photos of Cyperus schweinitzii (020719g): K11 (detail habitat: sand dune active blowout, scale to ruler) K12 (detail habitat: sand dune semiactive blowout, scale to ruler)

plant numbers: 5 plants counted in 1 m X 5 m area; plants have inflorescence with young to mature flowers

note: associated with Cyperus schweinitzii (020719g); marked by pink tape on low choke cherry 8 m @ 80° toward site; aspen / choke cherry grove to NW up the slope, and young successional aspen at the base of the slope

habitat: sand dune ridge slope of semiactive to semistable old blowout slope (12° to 22° toward 220° - SW) with subxeric sand grassland of 50-75% SOIL (sand) - LITTER; 5-20% Cyperus schweinitzii - Carex pensylvanica var. digyna; <1% Calamovilfa longifolia - Lygodesmia juncea - **Shinneroseris rostrata**

map/date site: Sr14 - Shinros-020719h

location: Wainwright Dunes Ecological Reserve; 2 km NW of the David Lake peninsula's southern tip; NE11-3-42-5W4; see figure and map Sr14 lat./long.: (centre) 52°35.375'N / 110°38.534'W (0.025') (GPS)

collection: none

photos: K13 (general habitat: sand dune blowout upper slope, pink flags mark plant locations) K14 (habitat detail: sand dune blowout upper slope, scale to ruler, plant in front of ruler) K15 (general habitat: sand dune blowout upper slope, pink flags mark plant locations)

plant numbers: 8 plants counted in 3 m X 7 m area; plant with inflorescence having 10% flowers

note: associated with Cyperus schweinitzii (020719g and 020719h); marked by pink tape on low choke cherry 8 m @ 80° toward site

habitat: sand dune ridge slope of semiactive to semistable old blowout with subxeric sand grassland of 50-75% SOIL (sand) - LITTER; 5-20% Cyperus schweinitzii - Carex pensylvanica var. digyna; <1% Calamovilfa longifolia - Lygodesmia juncea - **Shinneroseris rostrata**

map/date site: Sr15 - Shinros-020719i

location: Wainwright Dunes Ecological Reserve; 2 km NW of the David Lake peninsula's southern tip; NE11-3-42-5W4; see figure and map Sr15
lat./long.: (centre) 52°35'339'N / 110°38.519'W (0.025') (GPS)

collection: none

photo: K16 (detail habitat: sand dune blowout slope crest) K17 (general habitat: sand dune blowout upper slope, pink flags mark plant locations)

plant numbers: 2 plants counted in 0.3 m X 1.5 m area

note: associated with Cyperus schweinitzii (020719l)

habitat: sand dune ridge old blowout slope (12° to 18° toward 265° - W) midsection with open to semiopen xeric to subxeric sand barrens of 50-75% SOIL (sand) - LITTER; 5-20% Calamovilfa longifolia - Cyperus schweinitzii; 1-5% Cladonina mitis - Carex pensylvanica var. digyna; <1% Cetraria ericetorum - Festuca saximontana - Heterotheca villosa - **Shinneroseris rostrata**

map/date site: Sr16 - Shinros-020719k

location: Wainwright Dunes Ecological Reserve; 2 km NW of the David Lake peninsula's southern tip; NE11-3-42-5W4; see map Sr16
lat./long.: (centre) 52°35.345'N / 110°38.534'W (0.025') (GPS)

collection: none

photo: none

plant numbers: 6 plants counted in three small groups in 1.5 m X 2 m area; all in mature inflorescence with young to mature flowers and young fruit

note: marked by pink ribbon as base of choke cherry on blowout crest;

habitat: sand dune ridge semistable blowout slope (12° toward 230° - SW) with semiopen xeric sand barrens of 50-75% SOIL (sand); 20-50% LITTER; 1-5% Calamovilfa longifolia - Carex pensylvanica var. digyna; <1% **Shinneroseris rostrata** - Helianthus couplandii - Rosa acicularis -

Lygodesmia juncea

map/date site: Sr17 - Shinros-020816b

location: Wainwright Dunes Ecological Reserve; 2.3 km W of the David Lake peninsula's southern tip; NE14-33-4-41-5W4; see figure and map Sr17
lat./long.: (centre) 52°34.683'N / 110°39.955'W (0.025') (GPS)
UTM27: (centre) 12N 0522640E 5825169N (30m) (GPS)

collection: 020816b1 (1 replicate @ PP-4877 / root / stem: 15-18 cm / inflorescence: 18 cm / flower: bud 30%, young 25%, mature 15%, late 15% / fruit: early 15%, mature 5%)

photos: N7 (general habitat: sand dune ridge slope, pink flags mark plants) N8 N9 (habitat detail: sand dune ridge slope, pink flags mark plants) O8 (plant detail: growth habit with flowering inflorescence)

plant numbers: 10 plants counted in 4 m X 20 m area; all with inflorescences, 10% flowering, 10% early fruiting, 25% midfruiting

note: associated with Chenopodium ?leptophyllum (see 020816c - Cl2); potential destruction of habitat and population from blown sand deposited in area; plants from half to two-thirds up blowout slope; choke cherry along crest of blowout erosion face

habitat: sand dune ridge semiactive blowout slope (30° toward 215° - SSW) with open to very open xeric sand barrens of 50-75% SOIL (sand); 5-20% Calamovilfa longifolia - Stipa comata - LITTER; 1-5% Carex pensylvanica var. digyna - Helianthus couplandii - Prunus virginiana; <1% Lygodesmia juncea - **Shinneroseris rostrata** - LICHEN - Soprobolus cryptandra - Chenopodium pratericola - Chenopodium ?leptophyllum - Arabis ?holboelii var. retrofracta - Heterotheca villosa

map/date site: Sr18 - Shinros-020816f

location: Wainwright Dunes Ecological Reserve; 2.3 km W of the David Lake peninsula's southern tip; SE3-4-42-5W4; see figure and map Sr18
lat./long.: (centre) 52°34.871'N / 110°39.659'W (0.025') (GPS)
UTM27: (centre) 12N 0522972E 5825518N (30m) (GPS)

collection: none

photo: N15 (general habitat: sand dune ridge slope, pink flags mark plant locations, occurs with Chenopodium ?leptophyllum)

plant numbers: 6 plants counted in 5 m X 30 m area; plants all with inflorescences in late flowering stage; plants occur one-third to one-hale way up blowout slope

note: associated with Chenopodium ?leptophyllum (020816f - Cl5); marked by pink ribbon on river birch on opposite side of blowout basin;

habitat: sand dune ridge semistable erosion slope (37° to 41° toward 235° – WSW) with semiclosed to semiopen xeric sand barrens of 20–50% SOIL (sand) – Calamovilfa longifolia – MOSS – Stipa curtiseta; 5–20% LITTER – Selaginella densa; 1–5% Koeleria macrantha – Carex pensylvanica var. digyna – LICHEN; <1% Elymus canadensis – Rosa acicularis – **Shinneroseris rostrata** – Chenopodium ?leptophyllum – Carex obtusata – Heterotheca villosa – Festuca saximontana – Lygodesmia juncea

map/date site: Sr19 – Shinros-020816h
location: Wainwright Dunes Ecological Reserve; 2.3 km W of the David Lake peninsula's southern tip; SE3-4-42-5W4; see figure and map Sr19
lat./long.: (centre) 52°34'756'N / 110°40.002'W (0.025') (GPS)
UTM27: (centre) 12N 0522587E 5825303N (30m) (GPS)
collection: none
photo: none
plant numbers: 2 plants counted in 0.5 m X 0.5 m area with inflorescences at late flowering and early fruiting
note: same blowout complex as 020816i (Sr20) and 020816j (Sr21)
habitat: sand dune ridge semiactive blowout slope with semiopen xeric sand barrens of 50–75% SOIL (sand); 5–20% LITTER – Calamovilfa longifolia; 1–5% Carex pensylvanica var. digyna; <1% Lygodesmia juncea – **Shinneroseris rostrata** – MOSS

map/date site: Sr20 – Shinros-020816i
location: Wainwright Dunes Ecological Reserve; 2.3 km W of the David Lake peninsula's southern tip; SE3-4-42-5W4; see figure and map Sr20
lat./long.: (centre) 52°34.770'N / 110°40.054'W (0.025') (GPS)
UTM27: (centre) 12N 0522526E 5825329N (30m) (GPS)
collection: none
photo: N11 (general habitat: sand dune ridge slope, looking SE, pink flags mark plant locations) N12 (general habitat: sand dune ridge slope, looking SE, pink flags mark plant locations)
plant numbers: 60 plants counted in 2 m X 4 m area; vigorous plants 24 cm tall with mature inflorescences in mid-flowering to mid-fruiting
note: marked by pink tape on common juniper at blowout crest; this in the same blowout complex as 020816h (Sr19) and 020816j (Sr21)
habitat: sand dune ridge semiactive blowout slope base with semiopen xeric sand barrens of 50–75% SOIL (sand); 20–50% LITTER; 5–20% Stipa curtiseta; 1-5% Carex pensylvanica var. digyna – LICHEN; <1% **Shinneroseris rostrata** – Carex praegracilis – Agropyron smithii

map/date site:	**Sr21 – Shinros-020816j**
location:	Wainwright Dunes Ecological Reserve; 2.1 km W of the David Lake peninsula's southern tip; SW2-4-42-5W4; see figure and map Sr21 lat./long.: (centre) 52°34.783'N / 110°40.087'W (0.025') (GPS) UTM27: (centre) 12N 0522490E 5825355N (30m) (GPS)
collection:	none
photos:	N13 (general habitat: sand dune ridge slope, pink flags mark plant locations) N14 (habitat detail: sand dune ridge slope, pink flags mark plant locations) O9 O10 (plant detail: vigorous growth, scale to ruler)
plant numbers:	9 plants counted in 2 m X 12 m area; all with inflorescences at mid-flowering to early to mid-fruiting; plats with vigorous growth
note:	same blowout complex as 020816h (Sr19) and 020816i (Sr20); marked by pink tape on common juniper at blowout crest
habitat:	sand dune ridge semistable blowout slope (40° toward 180° - S), three-quarters up blowout erosion face, with semiopen xeric sand barrens of 50-75% SOIL (sand); 5-20% Calamovilfa longifolia - LITTER; 1-5% Carex pensylvanica var. digyna - Carex obtusata - **Shinneroseris rostrata** - Helianthus couplandii; <1% MOSS - Chenopodium ?leptophyllum - Juniperus horizontalis

Photos: Photographs of habitats and plant locations for *Shinneroseris rostrata* in the Wainwright Dunes Ecological Reserve

- Sr4—Shinros-020715d
    - H5 (plant detail: growth habit, note inflorescence with less than 10% open flowers)
    - H6 (flower detail: single flowers)
    - H7 (flower detail: single flowers)
    - H8 (detail habitat: sand dune blowout slope, population in upper half of blowout habitat)
    - H9 (general habitat: sand dune blowout slope, population in upper half of blowout habitat, pink flags mark plants)

- Sr7—Shinros-020716h
    - H14 (plant detail: growth habit with inflorescence)
    - H15 (plant detail: growth habit with inflorescence)
    - G21 (general habitat: sand dune semiactive blowout)
    - G22 (habitat detail: sand dune semiactive blowout, scale to ruler between 2 plants)

- Sr8—Shinros-020718c
    - H20 (plant detail: growth habit, scale to ruler)
    - H21 (plant detail: growth habit, scale to ruler)
    - H22 (plant detail: growth habit, scale to ruler)
    - H23 (Lygodesmia juncea: growth habit, scale to ruler, note rambling stem growth and shorter leaves)
    - H24 (plant detail: growth habit of Shinneroseris rostrata compared with Lygodesmia juncea)
    - H25 (plant detail: growth habit of Shinneroseris rostrata compared with Lygodesmia juncea)
    - I15 (general habitat: dune ridge blowout, looking N, eastern plants marked by pink flags)
    - I16 (general habitat: dune ridge blowout, western plants marked by pink flags, note coyote den)
    - I17 (detail habitat: dune ridge blowout, western plants, scale to ruler)

- Sr9—Shinros-020718e
    - I19 (general habitat: sand dune semiactive blowout, looking east, flags mark plant locations)
    - I20 (general habitat: sand dune semiactive blowout, looking west, flags mark plant locations)
    - I21(habitat detail: sand dune semiactive blowout crest, flags mark plant locations)

- Sr10—Shinros-020718f
    - I22 (general habitat: sand dune with active blowout deposition adjacent to plants, looking west, flags mark plant locations)
    - I23 (habitat detail: sand dune with active blowout deposition adjacent to plants, flags mark plant locations)

- Sr11—Shinros-020718g
    - J0 (plant detail: growth habit with inflorescence)

- Sr12—Shinros-020719f
    - J6 (habitat detail: sand dune blowout crest with several vigorous plants)
    - J7 (plant detail: growth habit on slope)
    - J8 (plant detail: growth habit on slope)
    - K8 (general habitat: sand dune blowout slope, pink flags mark plant locations)
    - K9 (general habitat: sand dune blowout slope crest, pink flags mark plants

locations)
  - K10 (general habitat: sand dune blowout basin and slope, pink flags mark plant boundary)

- Sr13—Shinros-020719g
  (see photos of Cyperus schweinitzii (020719g))

- Sr14—Shinros-020719h
  - K13 (general habitat: sand dune blowout upper slope, pink flags mark plant locations)
  - K14 (habitat detail: sand dune blowout upper slope, scale to ruler, plant in front of ruler)
  - K15 (general habitat: sand dune blowout upper slope, pink flags mark plant locations)

- Sr15—Shinros-020719i
  - K16 (detail habitat: sand dune blowout slope crest)
  - K17 (general habitat: sand dune blowout upper slope, pink flags mark plant locations)

- Sr17—Shinros-020816b
  - N7 (general habitat: sand dune ridge slope, pink flags mark plants)
  - N8 (habitat detail: sand dune ridge slope, pink flags mark plants)
  - N9 (habitat detail: sand dune ridge slope, pink flags mark plants)
  - O8 (plant detail: growth habit with flowering inflorescence)

- Sr18—Shinros-020816f
  - N15 (general habitat: sand dune ridge slope, pink flags mark the plant locations, occurs with Chenopodium ?leptophyllum)

- Sr20—Shinros-020816i
  - N11 (general habitat: sand dune ridge slope, looking SE, pink flags mark plant locations)
  - N12 (general habitat: sand dune ridge slope, looking SE, pink flags mark plant locations)

- Sr21—Shinros-020816j
  - N13 (general habitat: sand dune ridge slope, pink flags mark plant locations)
  - N14 (habitat detail: sand dune ridge slope, pink flags mark plant locations)
  - O9 (plant detail: vigorous growth, scale to ruler)

- O10 (plant detail: vigorous growth, scale to ruler)

WAINWRIGHT DUNES ECOLOGICAL RESERVE
VASCULAR PLANT FLORA
DISCUSSION PAPER

Ian D. Macdonald
March 2003

The following compilation list of vascular plant species from the Wainwright Dunes Ecological Reserve and immediate vicinity is a based on the several reports and observation and collection notes made prior to 2002, augmented by the on-site observations and records of Ian D. Macdonald made between June and August 2002. This list is presented to consolidate the available species lists from the area; to indicate those records that are added to the existing compilations from the current project's findings; to clarify the known sources for the various records of each species; to indicate those species occurrence claims for which there are vouching specimens; and to indicate those species that present extensions from their continuous biogeographic ranges in the province; and to highlight significances of the species. Such a cumulative presentation of the known flora will assist in the preparation of a scientifically acceptable flora that will contribute to the expansion of the province's overall flora.

The several biophysical and inventory reports conducted between 1977 and 2001 served as sources for this flora: Bradley & Bradley (1977), Fehr (1984), Cottonwood Consultants, Ltd. (1986), Wallis (1990), the Reserve's management plan (1998) and Miejer (2001), as did other collection and other record sources: Johnson (1992), Cotterill (2000 2003), Alberta Natural Heritage Information Centre (ANHIC) (2002) and the author (Macdonald 2002). In all, the 506 taxa herein listed include 415 confident records and an additional 6 tentative records that have been confirmed as occurring within the current Ecological Reserve's boundaries, of which 33 are non-native species, generally of Eurasian origins. Additionally there are 31 confident records that are known to occur adjacent to the Reserve, but have not yet been confirmed from actually within it, and another 50 confident records for which there was insufficient information to confirm whether or not they occurred within or outside the Reserve's boundaries, 10 of these being non-native species. The largest families listed here are Asteraceae (62 species), Poaceae (55) and Cyperaceae (53). Of the 68 taxa listed herein, 61 appear to be new records that have been observed or collected by Macdonald in 2002 from within the Reserve, and 5 others from adjacent to the Reserve. Additionally, the occurrence of 58 taxa appear to represent extensions to their ranges, for the most part being some 50 km to 100 km from their next-nearest Grassland, Parkland and southern Boreal locations, as mapped in the *Flora of Alberta*, but in several cases being considerable extensions from their Rockies or far northern or western Parkland ranges, as for *Minuartia dawsonensis, Silene menziesii* and *Thalictrum occidentale*. Of note are the 19 taxa that are currently listed by ANHIC as being rare in Alberta at a level of S1, S2, S2S3 or S3W (? indicates problematic determination): *Botrychium multifidum* var. *intermedium* (leather grape fern), *Najas flexilis* (slender naiad), *Ruppia cirrhosa* (widgeon-grass), *Elodea ?bifoliata* (two-leaved waterweed), *Muhlenbergia asperifolia* (scratch grass), *Carex crawei* (Crawe's sedge), *Carex ?houghtoniana* (Houghton's sedge), *Carex parryana* (Parry's sedge), *Cyperus schweinitzii* (sand nut-grass), *Eleocharis ?elliptica* (slender spike-rush), *Chenopodium ?leptospermum* (narrow-leaved goosefoot), *Drosera linearis* (slender-leaved sundew), *Gentiana fremontii* (marsh gentian), *Asclepias ovalifolia* (low milkweed), *Lycopus americanus* (American water-horehound), *Veronica ?catenata* (water speedwell), *Hedyotis longifolia* (long-leaved bluets), *Aster pauciflorus* (few-flowered aster) and *Shinneroseris rostrata* (annual skeletonweed).

The plants are presented in the Engler Prantl sequence that appears in the *Flora of Alberta* (Moss 1983); this will aid in referring to this accepted text for the province's flora and should be technically acceptable to botanists. The nomenclature conforms to that used by ANHIC; where there are recent revisions to the nomenclature that are current elsewhere, or where it differs from the original citation, the synonyms are indicated with brackets: (=). In many cases the subspecific or varietal level appropriate to the Alberta flora is added by the author, but was not included in the original lists of the previous surveyors. Species that are not native to Alberta are indicated by an asterisk (*) following the species name, and a question mark (?) indicates some query for the occurrence record.

In the column to the far left of the species names the sources for the various occurrence claims examined during this study are indicated following the single letter codes indicated in the list below. Where there is a known vouching collection, the code letter is underlined, otherwise the records appear to be based on still credible but unvouchered observations. There may be additional pre-2002 records in reports and actual collections which could not be examined during this present project, and if overlooked, the author apologizes; hence, further modification or use of this list should also attempt to include them. Collections of apparently new additions to the list by the author have been submitted to Alberta Community Development, Parks and Protected Areas in Edmonton for deposition in their herbarium and at the University of Alberta herbarium.

In the adjacent column a series of symbols is presented to clarify the actual occurrence of the species within the present study area boundaries. In many cases the several sources cited each other but did not indicate the location of the sighting; hence, those element occurrences in the earlier, larger study area that included Ribstone Creek, Wallaby Lake and the section east of the present Ecological Reserve boundary possibly were included in the subsequent lists. The offshore portions of David Lake adjacent to the mapped boundary line are considered to be a part of the study area. This column is intended to help clarify the presence of the species within the actual present boundaries, as follows: **C** (confident determination, confirmed occurrence within current boundaries); **B** (confident determination, confirmed occurrence adjacent to but not within current boundaries, to be sought); ~ (confident determination, but insufficient information to establish whether in or out of study area, further consideration required); and ? (tentative or questionable determination requiring substantiation or confirmation) .

The column to the right of the species names present brief comments where warranted that indicate several topics regarding the plants, as follows: **new** (whether the record is new to overall list); **ALBERTA RARE** (whether the species has provincially rarity status according to the current ANHIC lists); **range** (whether there is any range significance at regional to local levels, that is whether the occurrence here is apparently far removed from its next-nearest previously reported locations in the province according to the maps in the Flora of Alberta); and other comments on the occurrence record where appropriate. The indication of "range" also is included to help augment and reinforce the claim of that the Reserve truly represents a transition between the southern Boreal and Grassland Subregions.

SOURCE CODES (in chronological sequence):

B Bradley, L. and C. Bradley. 1977. Aspen Grove resource assessment: Wainwright area. Parks Planning and Design Branch, Alberta Recreation, Parks and Wildlife, Edmonton.

F Fehr, A. 1984. Wainwright Study Area: Biophysical Inventory. Natural Areas Program, Public Lands Division, Alberta Energy and Natural Resources, Technical Report No. t/65, Edmonton. (Fb indicates where Fehr only cites the Bradley's record but apparently did not actually see it himself; several species occurrence records were excluded from this list in P (see below) and in the present list).

C Cottonwood Consultants, Ltd. 1986. The Proposed Wainwright Ecological Reserve—A Biophysical Overview. Alberta Recreation and Parks, Edmonton.

W Cliff Wallis. 1990. Reconnaissance Survey of Saline Wetlands and Springs in the Grassland – Parkland Region of Eastern Alberta. Cottonwood Consultants, Ltd., Calgary and Alberta Lands, Forestry and Wildlife (Natural and Protected Areas), for World Wildlife Fund Canada and Alberta Forestry, Lands and Wildlife, Prairie for Tomorrow, Edmonton.

J Derek Johnson. 29 July 1992. (observation and collection records).

P Wainwright Dunes Ecological Reserve Management Plan. February 1998. Alberta Agriculture, Food and Rural Development, and Alberta Environmental Protection, Edmonton. (includes 1998 contributions from Wallis, Cotterill and Johnson).

c Patsy Cotterill. 15 July 2000. (observation and collection records), and 2003 (Personal

Communications - 4 March 2003).

m Miejer, M. 2001. Survey of Rare Plant Element Occurrences in the Central Parkland Natural Subregion (includes Rare Native Plant Forms). open file, ANHIC, Edmonton.

A ANHIC Records for Tracked Species Occurrences. 26 May 2002. Alberta Natural Heritage Information Centre, Alberta Community Development, Edmonton.

M Ian D. Macdonald. 12-16 June 2002, 10-21 July 2002, 15-19 August 2002. (observation and collection records).

VASCULAR PLANT FLORA

FERNS AND FERN ALLIES

LYCOPODIACEAE		
M	C	Lycopodium clavatum subsp. monostachyon—new - range
SELAGINELLACEAE		
BFCPM	C	Selaginella densa var. densa
EQUISETACEAE		
BFPM	C	Equisetum arvense var. arvense
FCPM	C	Equisetum fluviatile
FM	C	Equisetum hyemale var. affine
F	B	Equisetum palustre—F at Ribstone Creek
BFbCPM	C	Equisetum pratense—range
BFCPM	C	Equisetum variegatum subsp. variegatum—range
OPHIOGLOSSACEAE		
cA	C	Botrychium multifidum var. intermedium—ALBERTA RARE - range - not relocated (see text)
ASPLENIACEAE		
F	-	Cystopteris fragilis

GYMNOSPERMS

CUPRESSACEAE		
BFJPM	C	Juniperus communis var. depressa
BFCPM	C	Juniperus horizontalis

MONOCOTYLEDONS

TYPHACEAE

BFCPM	C	Typha latifolia

SPARGANIACEAE

M	B	Sparganium angustifolium var. angustifolium—new - adjacent to WDER
F	C	Sparganium angustifolium var. chlorocarpum (= Sparganium chlorocarpum)
FCP	B	Sparganium minimum—F - east of Ribstone Creek area
CP	C	Sparganium (species)

POTAMOGETONACEAE

FM	B	Potamogeton filiformis—E of WDER
F	B	Potamogeton friesii—not repeated in C or P lists, possibly only in Wallaby Lake?
FM?	B?	Potamogeton ?gramineus—adjacent to WDER - M a tentative sight record only
M	C	Potamogeton pectinatus (= Stuckenia pectinata)—new
F	B	Potamogeton pusillus—not repeated in C or P lists, possibly only in Wallaby Lake?
F	B	Potamogeton vaginatus—not repeated in C or P lists, possibly only in Wallaby Lake?
FCPM	C	Potamogeton zosteriformis
CPM	B	Potamogeton (species)

NAJADACEAE

FA	C	Najas flexilis—ALBERTA RARE - Fehr: not in report but has collection from WDER - M not recorded in Reserve - see text

RUPPIACEAE

FCWPA	C?	Ruppia cirrhosa (= R. maritima var. occidentalis, = R. occidentalis)—ALBERTA RARE - reported from David Lake - not mapped from here by Rare Vascular Plants of Alberta - M not recorded in Reserve - see text

ZANICHELLIACEAE

BFCWPM	C	Triglochin maritima
BFWM	C	Triglochin palustris

ALISMATACEAE

BFCPM	C	Alisma plantago-aquatica
BFCPM	C	Sagittaria cuneata

HYDROCHARITACEAE

F?	C?	Elodea ?bifoliata (= Elodea canadensis, E. longivaginata Anacharis canadensis)—Fehr: from Great Fen area - not mapped by ANHIC - possibly the ALBERTA RARE - M not recorded in Reserve - see text

POACEAE

M	B	X Agrohordeum macounii—new
BF	~	Agropyron dasystachyum var. riparium (= Elymus lanceolatus subsp. lanceolatus)
M	C	Agropyron desertorum*—new
M	C	Agropyron fragile*—new
FJPM	C	Agropyron pectiniforme* (= Agropyron cristata)
FM	C	Agropyron repens* (= Elytrigia repens var. repens)
BFWM	C	Agropyron smithii var. smithii (= Pascopyrum smithii)
F	B	Agropyron trichophorum*—F - specimen?
BFCPM	C	Agropyron trachycaulum var. trachycaulum (= Elymus trachycaulus subsp. trachycaulus
BFM	C	Agropyron trachycaulum var. subsecundum and var. glaucum (= Elymus trachycaulus subsp. subsecundus)
BFJPM	C	Agrostis scabra
FM	C	Agrostis stolonifera var. palustris(*)
BFJPM	C	Alopecurus aequalis
F	B	Avena sativa*
BFM	C	Beckmannia syzigachne subsp. baicalensis
BFJPM	C	Bouteloua gracilis
BF	C	Bromus anomalus*
F	B	Bromus biebersteinii*
BFM	C	Bromus ciliatus
BFJPM	C	Bromus inermis subsp. inermis*
BFCPM	C	Calamagrostis canadensis
BFCWPM	C	Calamagrostis inexpansa (= Calamagrostis stricta subsp. inexpansa)
M	C	Calamagrostis stricta subsp. stricta—new
BFCPM	C	Calamovilfa longifolia var. longifolia
M	C	Catabrosa aquatica—new - range
BF(CP)M	C	Danthonia intermedia—CP cited this species as D. californica, Wallis confirms is not the rare D. californica
BFCWPM	C	Deschampsia cespitosa var. cespitosa
FCPM	C	Distichlis stricta var. stricta
BFCPM	C	Elymus canadensis var. brachystachys

BFCP	C	Festuca campestris (= Festuca scabrella)
BFCPM	C	Festuca saximontana
M	B	Festuca trachyphylla*—new - M adjacent to WDER north of David Lake
FM	C	Glyceria borealis
BFJPM	C	Glyceria grandis
BFM	C	Glyceria striata var. stricta
CP	C	Glyceria (species)
BFCP	C	Helictotrichon hookeri
BFPM	C	Hierochloe odorata subsp. odorata (= Anthoxanthum nitens)
BFCWPM	C	Hordeum jubatum subsp. jubatum
BFCPM	C	Koeleria macrantha forma macrantha (= Koeleria cristata)
WAM	C	Muhlenbergia asperifolia—ALBERTA RARE - extensive population in David Lake basin - see text
FCPM	C	Muhlenbergia glomerata
BFbCWPM	C	Muhlenbergia richardsonis
BM	C	Oryzopsis asperifolia
BFCPM	C	Oryzopsis hymenoides
FM	C	Oryzopsis pungens
FCP	~	Phalaris arundinacea
F	C	Phleum pratense*
FM?	C	Poa arida—range - M record may be tentative
M	C	Poa compressa (*)—new
BFCPM	C	Poa interior
FCPM	C	Poa palustris
FPM	C	Poa pratensis var. pratensis*
M	C	Poa sandbergii (= Poa secunda)—new
FCWPM	C	Puccinellia nuttalliana
FCPM	C	Schizachne purpurascens var. purpurascens
F	C	Scolochloa festucacea
F	~	Setaria viridis*
M	C	Sphenopholis intermedia (= Sphenopholis obtusata var. major)—new
BFCPM	C	Sporobolus cryptandrus
FM	C	Stipa comata
FCPM	C	Stipa curtiseta (= Stipa spartea var. curtiseta)
M	C	Stipa viridula (= Nassella viridula)—new

CYPERACEAE

FWM	C	Carex aquatilis var. aquatilis
BFbM	C	Carex atherodes

WPM	C	Carex aurea
M	C	Carex bebbii—new
FCPM	C	Carex canescens (= Carex curta)
FCPM	C	Carex capillaris subsp. chlorostachys—range
M	C?	Carex chordorrhiza—new - range - in Great Fen - M confident sight record, but needs confirming collection
JPcAM	C	Carex crawei—ALBERTA RARE - see text
FCP	C	Carex crawfordii—range
FCW?PM	C	Carex diandra—range
FCPM	C	Carex disperma—range
FCPM?	C	Carex douglasii
BFbCPM	C	Carex filifolia—range
WJPM	C	Carex gynocrates (= Carex dioica)
CP	C?	Carex houghtoniana—ALBERTA RARE - Wallis confident of report, specimen may exist - M not observed within Reserve - see text
FCPM	C	Carex interior—range
PM	C	Carex lanuginosa (= Carex lasiocarpa var. latifolia)
F?CPM	C	Carex lasiocarpa var. americana—range - FCP cited no variety, may be Carex lanuginosa
PM	C	Carex leptalea—range
FCPM	C	Carex limosa—range
FCP	B	Carex livida—range - F - NE of WDER
M	B	Carex microptera—new - range - E of WDER
FM	C	Carex obtusata
FCWPmAM	C	Carex parryana subsp. parryana—ALBERTA RARE - range
M	C	Carex peckii—new - range
FPM	C	Carex pensylvanica var. digyna (= Carex inops subsp. heliophila)
FCPM	C	Carex praegracilis
FCWPM	C	Carex prairea—range
FPM	C	Carex sartwellii
CWPM	C	Carex scirpoidea var. scirpoidea
FPM	C	Carex siccata—F: habitat context of habitat notes for Carex foenea imply this species, not the rare Carex aenea
FPM	C	Carex sprengelii
BFCPM	C	Carex stenophylla subsp. eleocharis (= Carex eleocharis)
CPM	C	Carex tenuiflora—range
FCPM	C	Carex utriculata (= Carex rostrata var. utriculata)—- FCP reported as Carex rostrata, not the rare var. rostrata
FCPM	C	Carex vaginata—range
FM	C	Carex viridula

CPM	~?	Carex (species)
BFCJPAM	C	Cyperus schweinitzii—ALBERTA RARE - many locations, see text
FM	C	Eleocharis acicularis—Fehr at Ribstone Creek in community survey records
FCPM	C	Eleocharis compressa *sensu lato*—Macdonald collection requires confirmation, may be provincially significant - Fehr: community data 021 and text indicates this is Eleocharis compressa var. borealis (= Eleocharis elliptica) which is ALBERTA RARE and is from Ribstone Creek - see text
FPM	C	Eleocharis palustris—Eleocharis erythropoda form
BFCPM	C	Eleocharis quinqueflora (= Eleocharis pauciflora var. fernaldii)—range
CP	~?	Eleocharis (species)
FCP	C	Eriophorum chamissonis—range
M	C	Eriophorum gracilis—new - range
BFCPM	C	Eriophorum polystachion (= Eriophorum angustifolium)
FCPM	C	Eriophorum viridi-carinatum
FCWPM	C	Scirpus acutus
FCP	C	Scirpus caespitosus
BFCPM	C	Scirpus microcarpus var. rubrotinctus
FCWPM	C	Scirpus pungens subsp. pungens (= Scirpus americanus)
BF?CPM	C	Scirpus validus (= Scirpus tabernaemontani)—Fehr: community data at Wallaby Lake
LEMNACEAE		
BFPM	C	Lemna minor
BFM	C	Lemna trisulca
		JUNCACEAE
FM	C	Juncus alpinoarticulatus
BFCWPM	C	Juncus balticus var. littoralis (= Juncus arcticus var. littoralis)
FJPM	C	Juncus bufonius
FM	C	Juncus longistylis
FWM	C	Juncus nodosus
FM	C	Juncus tenuis var. dudleyi
CP	C	Luzula multiflora (= Luzula campestris var. multiflora)—range
		LILIACEAE
BFbM	C	Allium textile
FCPM	C	Disporum trachycarpum
BFCPM	C	Lilium philadelphicum var. andinum
BFCPM	C	Maianthemum canadense
BFCPM	C	Smilacina stellata (= Maianthemum stellatum)

FM	C	Smilacina trifolia (= Maianthemum trifolium)
BFCPM	C	Tofieldia glutinosa var. glutinosa
BFCWPM	C	Zigadenus elegans subsp. elegans

IRIDACEAE

BFCWPM	C	Sisyrinchium montanum var. montanum

ORCHIDACEAE

CP	~	Amerorchis rotundifolia (= Orchis rotundifolia)
F	C	Coeloglossum viride (= Habenaria viridis var. bracteata)—not listed in P
CP	~	Corallorhiza maculata
BFM	C	Corallorhiza trifida
BFCM	C	Cypripedium calceolus var. parviflorum—FC cited no variety
BFCPM	C	Platanthera dilatata var. dilatata (= Habenaria dilatata)—range
BFCWPM	C	Platanthera hyperborea (= Habenaria hyperborea)
FCPM	C	Platanthera obtusata (= Habenaria obtusata)
JPM	C	Spiranthes romanzoffiana

CHORIPETALOUS DICOTYLEDONS

SALICACEAE

BFCPM	C	Populus balsamifera var. balsamifera—BFCP cited no variety
M?	C?	Populus balsamifera var. trichocarpa—new - Macdonald record tentative
BFCPM	C	Populus tremuloides var. tremuloides
BFCPM	C	Salix bebbiana var. bebbiana
BFCWPM	C	Salix candida
FCPM	C	Salix discolor
BFbP	~	Salix exigua (= Salix interior)—P cited no source or variety
BFbM	B	Salix lutea
FCPM	C	Salix maccalliana
FCPM	C	Salix myrtillifolia var. cordata—FCP cited no variety, but probably this tall shrub
M?	C?	Salix myrtillifolia var. myrtillifolia—new? - Macdonald has tentative but likely field sighting of var. myrtillifolia, the low shrub variety from N of David Lake - collection required
BFCPM	C	Salix pedicellaris—range
BFCPM	C	Salix petiolaris

FCWPM	C	Salix planifolia subsp. planifolia
FPM	C	Salix pseudomonticola
BFb	~	Salix pyrifolia—all Macdonald's initial field determinations were Salix pseudomonticola
FCPM	C	Salix serissima

BETULACEAE

BFbCP	~	Alnus tenuifolia (= Alnus incana subsp. tenuifolia)
M	C	Betula neoalaskana—range - new
BFbCPM	C	Betula occidentalis var. occidentalis—CP cited no variety
BFCPM	C	Betula papyrifera var. papyrifera
BFCWPM	C	Betula pumila var. glandulifera—range
BFCPM	C	Corylus cornuta var. cornuta

URTICACEAE

BFCPM	C	Utrica dioica var. gracilis (= Urtica gracilis)

SANTALACEAE

BFCPM	C	Comandra umbellata var. pallida—P cited no variety

POLYGONACEAE

BFM	C	Polygonum amphibium var. stipulaceum (= Polygonum natans forma harwtrightii) (water smartweed)
JPM	C	Polygonum arenastrum* (common knotweed)
BF	C	Polygonum convolvulus*
M	C	Polygonum erectum (striate knotweed)—new
FJPM	C	Polygonum lapathifolium
BF	~	Polygonum ramosissimum
FM	C	Rumex acetosella subsp. acetosella*
FM	C	Rumex maritimus var. fueginus
BF	C	Rumex occidentalis
BFb	~	Rumex triangulivalvis (= Rumex mexicanus)
JPM	C	Rumex venosus—range

CHENOPODIACEAE

M	C	Atriplex prostrata*—new
PM	C	Axyris amaranthoides*
BFJPM	C	Chenopodium album*
M	C	Chenopodium gigantospermum—new
M?	C?	Chenopodium ?leptophyllum—ALBERTA RARE - new - problem

		determination, may be Chenopodium pratericola or C. dissectum - see text
BFM	C	Chenopodium pratericola
M	C	Chenopodium rubrum var. rubrum—new
WM	C	Chenopodium salinum
FPM	C	Monolepis nuttalliana
FCP	C	Salicornia europaea subsp. rubra (= Salicornia rubra)—F community sample 042 gives as Salicornia aristata - name not in synonyms of Kartesz (1994)
M	C	Salsola kali var. tenuifolia*—new
FCWPM?	C	Suaeda calceoliformis (= Suaeda depressa)—M? citation tentative, plants named on-site were mostly young, non-flowering Aster brachyactis plants

AMARANTHACEAE

M	C	Amaranthus blitoides*—new
M	C	Amaranthus retroflexus*—new

NYCTAGINACEAE

BFCPM	C	Mirabilis hirsuta

CARYOPHYLLACEAE

BFCPM	C	Cerastium arvense
FP	~	Cerastium nutans—range - not the provincially rare species
M	C	Cerastium vulgatum* (= Cerastium fontanum subsp. vulgare)—new
M	C	Minuartia dawsonensis—new - range extension from Rockies and northern Boreal - Great Fen
FPM	C	Moehringia lateriflora
BFbM	C	Silene drummondii var. drummondii—range
M	C	Silene menziesii var. menziesii—new - range extension
M	C	Stellaria calycantha var. calycantha—new - range
BFb	~	Stellaria crassifolia
BFM	C	Stellaria longifolia
BFPM	C	Stellaria longipes

CERATOPHYLLACEAE

FCPM	B	Ceratophyllum demersum—F - not in community data - E of WDER

RANUNCULACEAE

BFCPM	C	Actaea rubra subsp. rubra
P	~	Actaea rubra forma neglecta—P alluded to this forma, but cited no

		source
BFCPM	C	Anemone canadensis
BFPM	C	Anemone cylindrica—P cited no source
FPM	C	Anemone multifida var. multifida
M	C	Anemone multifida var. richardsiana—new
BFCPM	C	Anemone patens var. multifida
M	B	Caltha natans—new - range - E of WDER - where specimen?
Bfb	~	Caltha palustris—Fehr: indicated "may not occur in study area, found in David Lake drainage area"
BFb	~	Ranunculus abortivus
BFb	~	Ranunculus aquatilis (= Ranunculus trichophyllus)
P	~	Ranunculus cardiophyllus—P cited no source
BFCPM	C	Ranunculus circinatus (= Ranunculus subrigidus)
BFCWPM	C	Ranunculus cymbalaria var. cymbalaria
BFCPM	C	Ranunculus gmelinii var. gmelinii—BFCP cited no variety
BFb	~	Ranunculus hyperboreus (= Ranunculus natans)
BFM	C	Ranunculus macounii
BFP	~	Ranunculus rhomboideus—P provides no source
BFPM	C	Ranunculus sceleratus var. multifidus
M	C	Thalictrum occidentale var. occidentale—new - based on large vegetative specimen, appears good - range extension from Rockies and western Parklands
BFCPM	C	Thalictrum venulosum var. venulosum

FUMARIACEAE

BFbP	~	Corydalis aurea subsp. aurea

BRASSICACEAE

PM	C	Arabis divaricarpa var. divaricarpa
F	~	Arabis hirsuta—Fehr: not in community data table
BFM	C	Arabis holboelii var. retrofracta
M	B	Camelina microcarpa*—new - E of WDER
FP	C	Capsella bursa-pastoris*—P cited no source - M not record within Reserve
BFPM	C	Cardamine pensylvanica—range
BFbPM	C	Descurania pinnata var. brachycarpa
FM	C	Descurania sophia*
BFb	~	Diplotaxis muralis*
FPM	C	Draba nemorosa var. leiocarpa
BFPM	C	Erysimum asperum var. asperum

BFPM	C	Erysimum inconspicuum
BFJPM	C	Lepidium densiflorum var. densiflorum
F	C	Lepidium ramosissimum—F specimen? - his community sample 042
BFPM	C	Lesquerella arenosa var. arenosa
M	C	Rorippa palustris var. palustris—new
M?	C	Rorippa palustris var. ?hispida—new? - M has tentative variety determination
M	C	Sisymbrium altissimum*—new
FPM	C	Thlaspi arvense*

DROSERACEAE

FCWPA	C	Drosera linearis—ALBERTA RARE - not observed during survey, see text
BFCP	C	Drosera anglica—formerly ALBERTA RARE - not observed during survey, see text - any specimens?

SAXIFRAGACEAE

BFPM	C	Heucheria richardsonii var. richardsonii
FCPM	C	Mitella nuda—range

PARNASSIACEAE

BFCWPM	C	Parnassia palustris var. neogaea (= Parnassia montanensis)

GROSSULARIACEAE

BFCPM	C	Ribes americanum
BFbPM	C	Ribes hirtellum—range
F	~	Ribes hudsonianum
X	M	Ribes lacustre—new
BFCPM	C	Ribes oxyacanthoides
FM	C	Ribes triste

ROSACEAE

BFCP	~	Agrimonia striata
BFCPM	C	Amelanchier alnifolia var. alnifolia
BFCPM	C	Chamaerhodos erecta var. nuttallii
BFM	C	Crataegus rotundifolia (= Crataegus chrysocarpa)
BFM	C	Fragaria virginiana var. glauca
BFCP	C	Geum aleppicum var. strictum
M?	C?	Geum macrophyllum var. ?macrophyllum—new - range - confident sight record based on distinctive basal leaf shape - needs confirming collection

M	C	Geum macrophyllum var. perincisum—new
BFCPM	C	Geum triflorum var. triflorum
BFCWPM	C	Potentilla anserina subsp. anserina
BFM	C	Potentilla arguta
FM	C	Potentilla concinna var. concinna
BF	B	Potentilla gracilis (no variety)
M	C	Potentilla gracilis var. flabelliformis—new
BFCP	C	Potentilla hippiana var. hippiana
FJPM	C	Potentilla norvegica var. norvegica
FCPM	C	Potentilla palustris var. palustris
FJPM	C	Potentilla pensylvanica var. pensylvanica
BF	C	Potentilla rivularis—Fehr: community data table indicated in WDER at site 034
FCPM	C	Prunus pensylvanica var. pensylvanica
BFCPM	C	Prunus virginiana subsp. melanocarpa
BFCPM	C	Rosa acicularis
BF	~	Rosa arkansana—not cited in CP - range
BFCPM	C	Rosa woodsii subsp. woodsii
BFCPM	C	Rubus idaeus subsp. melanolasius (= Rubus strigosus)
BFCPM	C	Rubus pubescens
BFCPM	C	Spiraea alba var. alba

FABACEAE

BF	~	Astragalus americanus (= Astragalus frigidus var. americanus)
BFb	~	Astragalus canadensis
BFPM	C	Astragalus dasyglottis
F	~	Astragalus flexuosus—not cited in CP
BFM	C	Astragalus striatus
cM	C	Glycerrhiza lepidota var. lepidota
F	~	Hedysarum alpinum subsp. americanum
BFCPM	C	Lathyrus ochroleucus
CPM	C	Lathyrus venosus subsp. intonsus
BFM	C	Medicago sativa subsp. sativa*
BM	B	Medicago sativa subsp. falcata* (= Medicago falcata)
BFb	B	Melilotus alba*
BF	B	Melilotus officinalis*
BFCP	C	Oxytropis monticola (= Oxytropis campestris var. gracilis)
BFPM	C	Oxytropis sericea var. spicata
BFCP	C	Psoralea argophylla
BFCPM	C	Thermopsis rhombifolia

JPM	C	Trifolium hybridum
JP	B	Trifolium repens*
BFCPM	C	Vicia americana var. americana—CP cited no variety
BF	C	Vicia americana var. minor (= Vicia sparsifolia)

GERANIACEAE

FP	C	Geranium richardsonii—range

LINACEAE

BFM	C	Linum lewisii subsp. lewisii (= Linum perenne)

EUPHORBIACEAE

M	C	Chamaesyce glyptospermum (= Euphorbia glyptosperma)—new - range

CALLITRICHACEAE

M	C	Callitriche verna (= Callitriche palustris)—new

ANACARDIACEAE

BFCPM	C	Rhus radicans var. rydbergii (= Toxicodendron radicans var. rydbergii)

MALVACEAE

BM	C	Sphaeralcea coccinea var. coccinea

CISTACEAE

FCPM	C	Hudsonia tomentosa—range

VIOLACEAE

BPM	C	Viola adunca
BFPM	C	Viola canadensis var. rugulosa (= Viola rugulosa)
BFWPM	C	Viola nephrophylla
M	C?	Viola nuttallii var. major—new - Macdonald confident sight record, but requires confirming collection
M	C?	Viola renifolia—new - Macdonald confident sight record, but requires confirming collection

CACTACEAE

BFCPM	C	Opuntia fragilis—range

ELAEAGNACEAE

BFCPM	C	Elaeagnus commutata

BFPM	C	Shepherdia canadensis

ONAGRACEAE

BFM	C	Epilobium angustifolium subsp. angustifolium
BFCPM	C	Epilobium ciliatum subsp. glandulosum (= Epilobium glandulosum)
BFCPM	C	Epilobium leptophyllum—range
BFb	~	Epilobium palustre
FM	C	Gaura coccinea var. coccinea—not cited by CP
FM	C	Oenothera biennis
BFM	C	Oenothera nuttallii

HALORAGACEAE

BFCPM	C	Myriophyllum exalbescens (= Myriophyllum spicatum)

HIPPURIDACEAE

BFCPM	C	Hippuris vulgaris

ARALIACEAE

BFCPM	C	Aralia nudicaulis

APIACEAE

FPM	C	Cicuta bulbifera—range
FWJPM	C	Cicuta maculata var. angustifolia (= Cicuta douglasii)
BFM	C	Heracleum lanatum
CPM	C	Osmorhiza depauperata
BFCPM	C	Sancula marilandica
BFCPM	C	Sium suave
BFPM	C	Zizia aptera var. occidentalis

CORNACEAE

BFCPM	C	Cornus canadensis
BFCPM	C	Cornus stolonifera var. stolonifera (= Cornus sericea)

SYMPETALOUS DICOTYLEDONS

PYROLACEAE

M	C	Moneses uniflora var. uniflora—new - north of Great Fen
BJPM	C	Orthilia secunda subsp. secunda (= Pyrola secunda)
BFCPM	C	Pyrola asarifolia var. asarifolia

M	C	Pyrola chlorantha—new
BF	B	Pyrola elliptica—any BF specimen?

ERICACEAE

BFPM	C	Arctostaphylos uva-ursi

PRIMULACEAE

BFP	C	Androsace septentrionalis—P cited no source
BFCWPM	C	Dodecatheon pulchellum subsp. pulchellum (= Dodecatheon radicatum)
BFCWPM	C	Glaux maritima subsp. maritima
BFJPM	C	Lysimachia ciliata (= Steironema ciliatum)
BFCPM	C	Lysimachia thyrsiflora
BFWPM	C	Primula incana

GENTIANACEAE

FCWPM	C	Gentiana fremontii—ALBERTA RARE - large population adjacent to WDER, see text - P cited as Gentiana prostrata var. americana, a species of the Rockies
F	-	Gentiana affinis—M not record in Reserve
FWM	C	Gentianella amarella subsp. acuta
FCPM	C	Gentianella crinita subsp. macounii (= G. macounii)

MENYANTHACEAE

BFCPM	C	Menyanthes trifoliata—range

APOCYNACEAE

M	C	Apocynum androsaemifolium var. androsaemifolium—new

ASCLEPIADACEAE

BFCPAM	C	Asclepias ovalifolia—formerly ALBERTA RARE - see text

POLEMONIACEAE

JPM	C	Collomia linearis
FM	C	Phlox hoodii subsp. canescens

BORAGINACEAE

FCPM	C	Cryptantha fendlerii—range
BFb	-	Cryptantha macounii
BFM	C	Hackelia americana

FPM	C	Lappula occidentalis (= Lappula redowskii)
BFPM	C	Lithospermum incisum
LAMIACEAE		
BFJP	C	Dracocephalum parviflorum (= Moldavia parviflora)
BFCPAM	C	Lycopus americanus—ALBERTA RARE - see text
BFM	C	Lycopus asper
BFCPM	C	Mentha arvensis var. glabrata
M	C	Monarda fistulosa var. menthaefolia—new
BFCPM	C	Prunella vulgaris subsp. lanceolatus—range - FCP cited no variety
FCPM	C	Scutellaria galericulata var. pubescens
BFCPM	C	Stachys palustris var. pilosa
SOLANACEAE		
M	C	Solanum triflorum—new - SW corner of WDER
		SCROPHULARIACEAE
BFM	C	Castilleja miniata—F is S of Wallaby Lake
F	C	Orthocarpus luteus—not cited by CP
BFCWPM	C	Pedicularis groenlandica—range
F	~	Penstemon gracilis—not cited by CP - M not record in Reserve
F	~	Penstemon procerus—M not record in Reserve
BFM	B	Veronica americana—M is E of WDER
BFb	~	Veronica catenata (= Veronica salina)—ALBERTA RARE - M not record in Reserve - see text
M	C	Veronica peregrina var. xalapensis—new
F	~	Veronica scutellata
OROBANCHACEAE		
FCP	B	Orobanche fasciculata var. fasciculata
LENTIBULARIACEAE		
FCP	C	Pinguicula vulgaris var. vulgaris—range
FCP	C	Utricularia intermedia—range
M	C	Utricularia minor—new - range
FCPM	C	Utricularia vulgaris subsp. macrorhiza
PLANTAGINACEAE		
FPM	C	Plantago major var. major*
RUBIACEAE		

BFCPM	C	Galium boreale var. intermedium
M	C	Galium labradoricum—new - range
BFJPM	C	Galium trifidum var. trifidum
BFCPM	C	Galium triflorum
CPA	C	Hedyotis longifolia (= Houstonia longifolia)—ALBERTA RARE - not seen

CAPRIFOLIACEAE

BCPM	C	Linnaea borealis var. americana
BPM	C	Lonicera dioica var. glaucescens
BFCPM	C	Symphoricarpos albus var. albus
BFCPM	C	Symphoricarpos occidentalis
BFCPM	C	Viburnum edule
BFCPM	C	Viburnum opulus subsp. trilobum (= Viburnum trilobum, = V. opulus var. americanum)—range - FCP cited no variety

CAMPANULACEAE

BFCPM	C	Campanula rotundifolia

LOBELIACEAE

BFCPM	C	Lobelia kalmii

ASTERACEAE

BFCPM	C	Achillea millefolium subsp. lanulosa—FCP cited no variety
BFWPM	C	Agoseris glauca
M	C	Ambrosia artemisiifolia var. elatior—new
BFCWPM	C	Antennaria parvifolia—FC cited as Antennaria nitida?
BFCP	B	Antennaria pulcherrima—range
F	B	Antennaria rosea
M	C	Artemisia biennis—new
BFCPM	C	Artemisia campestris subsp. caudata (= Artemisia forwardii)
M	C	Artemisia dracunculus var. dracunculus—new
BFCPM	C	Artemisia frigida var. frigida
F	B	Artemisia longifolia—not cited by CP - F: at Wallaby Lake
BFCPM	C	Artemisia ludoviciana var. ludoviciana—BFCP cited no variety
M	C	Artemisia ludoviciana var. gnaphaloides—new?
BFWJPM	C	Aster borealis (= Aster junciformis)
M	C	Aster brachyactis—new
BFCPM	C	Aster ciliolatus
BFWM	C	Aster ericoides subsp. pansus (= Aster pansus, Virgulus ericoides)
M	C	Aster hesperius var. hesperius—new

BFCWPM	C	Aster laevis var. geyeri
WmAM	C	Aster pauciflorus (= Almutaster pauciflorus)—ALBERTA RARE - in David Lake basin, see notes
BFCPM	C	Bidens cernua
FJPM	C	Cirsium arvense var. arvense*
CP	~	Cirsium drummondii—range
FWPM	C	Cirsium flodmanii
BFb	~	Cirsium foliosum—range
BFbM?	C	Cirsium undulatum—Macdonald field identification tentative
BFM	C	Cirsium vulgare*
BFWM	C	Crepis runcinata subsp. runcinata
BFJPM	C	Crepis tectorum*
M	C	Erigeron annuus subsp. septentrionalis (= Erigeron strigosus)
BFP	C	Erigeron caespitosus—P cited no source
W	~	Erigeron elatus—range - may be Erigeron lonchophyllus - any Wallis specimen?
JPM	C	Erigeron glabellus subsp. glabellus—JP cited no variety
F	C	Erigeron glabellus subsp. pubescens
M	C	Erigeron lonchophyllus—new - range
BFPM	C	Erigeron philadelphicus
FCP	~	Erigeron pumilus subsp. pumilus—CP cited no variety
BFJPM	C	Gaillardia aristata
BFbM	C	Gridelia squarrosa var. squarrosa
BFb	~	Haplopappus lanceolatus
M	C	Helenium autumnale var. montanum—new
F	~	Helianthus annuus—may actually include Helianthus couplandii
M	C	Helianthus couplandii—new? - widespread on sand dunes
F	~	Helianthus nuttallii
JPM?	C	Helianthus subrhomboideus (= Helianthus laetiflorus var. subrhomboideus)—M record tentative but probable
BFCPM	C	Heterotheca villosa var. villosa (= Chrysopsis villosa)
BFb	~	Hieracium umbellatum sensu lato (= Hieracium canadense)
BFM	C	Lactuca pulchella subsp. pulchella
BFbCWP	~	Liatris ligulistylis
BFCPM	C	Lygodesmia juncea
M	C	Matricaria matricarioides* (= Matricaria suaveolens)—new
BFCPM	C	Petasites frigidus var. palmatus (= Petasites palmatus)
BFM	C	Petasites sagittatus (= Petasites frigidus var. sagittatus)
BFbM	C	Petasites vitifolius
BFbM	C	Ratibida columnifera

BFPM	C	Senecio canus (= Packera cana)
FCPM	C	Senecio congestus
FCP	~	Senecio indecorus (= Packera indecora)—range
FPM	C	Senecio pauperculus (= Packera paupercula)
CJPAM	C	Shinneroseris rostrata (= Lygodesmia rostrata)—ALBERTA RARE - see text
BFWJPM	C	Solidago canadensis var. canadensis (= Solidago lepida, Solidago pruniosa)—P cited no variety
BFbM	C	Solidago gigantea var. serotina
M	C	Solidago graminifolia (= Euthamia graminifolia var. graminifolia)—new
BFJPM	C	Solidago missouriensis var. fasciculata—JP cited no variety
FJPM	C	Solidago nemoralis var. longipetiolata
F	C	Solidago rigida
BFM	C	Solidago spathulata var. neomexicana (= Solidago decumbens var. ereophila)
BFJPM	C	Sonchus uliginosus* (= Sonchus arvensis var. uliginosus)
FM	C	Sonchus asper*
FPM	C	Taraxacum officinale*
FP	C	Tragopogon dubius*

EXCLUDED SPECIES

BFb	~	Physaria didymocarpa—Rocky Mountain species
BFb	~	Penstemon eremophila—Rocky Mountain species
F	~	Senecio lugens—Rocky Mountain species
M?	~	Calla palustris—M field notes unclear, may be confused with Callitriche palustris
F	C	Salicornia aristata—not in the synonyms listed in Kartesz 1994

NUMERICAL SUMMARY

(! = confident ? = tentative)

X determined! in!WDER	B detemined! out!WDER	~ determined! in?/out?WDER	C? determined? in!WDER	C* non-native in!WDER	B* non-native out!WDER	C new NEW in!WDER	B new NEW out!WDER
415	31	50	10	33	10	61	5

WAINWRIGHT DUNES ECOLOGICAL RESERVE
VASCULAR PLANT FLORA OF THE GREAT FEN

The following compilation list of 86 vascular plant species from the Great Fen located within the Wainwright Dunes Ecological Reserve, 1.5 to 3 km NW of David Lake, from the on-site observations and records of Ian D. Macdonald made between June and August 2002.

SHRUBS
Juniperus horizontalis, Salix candida, Salix discolor, Salix lutea, Salix maccalliana, Salix myrtillifolia var. cordata, Salix pedicellaris, Salix petiolaris, Salix planifolia subsp. planifolia, Salix pseudomonticola, Salix serissima, Betula occidentalis var. occidentalis, Betula pumila var. glandulifera, Ribes lacustre, Rosa acicularis, Viburnum edule

FERNS
Equisetum fluviatile, Equisetum variegatum subsp. variegatum

GRAMINOIDS
Typha latifolia, Triglochin maritimum, Agropyron trachycaulum var. subsecundum, Bromus ciliatus, Calamagrostis inexpansa, Muhlenbergia glomerata, Poa pratensis var. pratensis*, Sphenopholis Intermedia, Carex aquatilis var. aquatilis, Carex aurea, Carex bebbii, Carex canescens, Carex capillaris subsp. chlorostachys, Carex chordorrhiza, Carex diandra, Carex disperma , Carex gynocrates, Carex interior, Carex lanuginosa, Carex leptalea, Carex limosa, Carex prairea, Carex tenuiflora, Carex utriculata, Carex vaginata, Eriophorum gracilis, Eriophorum polystachion, Eriophorum viridi-carinatum, Juncus longistylis

FORBS
Smilacina trifolium, Tofieldia glutinosa var. glutinosa, Corallorhiza trifida, Cypripedium calceolus var. parviflorum, Habenaria dilatata, Habenaria hyperborea, Habenaria obtusata, Rumex occidentalis, Minuartia dawsonensis, Moehringia lateriflora, Silene menziesii var. menziesii, Stellaria crassifolia, Stellaria longifolia, Stellaria longipes, Cardamine pensylvanica, Drosera linearis (reported, not seen), Drosera anglica (reported, not seen), Mitella nuda, Parnassia palustris var. neogaea, Potentilla palustris var. palustris, Rubus pubescens, Viola renifolia, Epilobium angustifolium subsp. angustifolium, Epilobium leptophyllum, Aralia nudicaulis, Cornus stolonifera var. stolonifera, Orthilia secunda subsp. secunda, Pyrola asarifolia var. asarifolia, Arctostaphylos uva-ursi, Lysimachia thyrsiflora, Menyanthes trifoliata, Pedicularis groenlandica, Galium boreale var. intermedium, Galium labradoricum, Galium trifidum var. trifidum, Galium triflorum, Linnaea borealis var. americana, Lonicera dioica var.

glaucescens, Aster borealis, Solidago canadensis var. canadensis

WAINWRIGHT DUNES ECOLOGICAL RESERVE
VASCULAR PLANT FLORA OF SLOPE FEN

The following compilation list of 92 vascular plant species from the slope fen located within the Wainwright Dunes Ecological Reserve, 600m north of David Lake central north shore (SE2-11-42-5W4), from the on-site observations and records of Ian D. Macdonald made between June and August 2002.

FERNS
Equisetum arvense var. arvense, Equisetum fluviatile

SHRUBS
Populus balsamifera var. balsamifera, Salix bebbiana var. bebbiana, Salix candida, Salix discolor, Salix maccalliana, Salix myrtillifolia var. myrtillifolia, Salix petiolaris, Salix pseudomonticola, Salix serissima, Betula occidentalis var. occidentalis, Betula pumila var. glanduiifera, Ribes triste, Rosa acicularis, Elaeagnus commutata, Shepherdia canadensis, Cornus stolonifera var. stolonifera, Viburnum opulus var. americanum

GRAMINOIDS
Agropyron trachycaulum var. trachycaulum, Agropyron trachycaulum var. subsecundum, Bromus ciliatus, Glyceria grandis, Glyceria striata var. stricta, Muhlenbergia glomerata, Poa palustris, Sphenopholis intermedia, Carex aquatilis var. aquatilis, Carex aurea, Carex capillaris subsp. chlorostachys, Carex diandra, Carex disperma, Carex interior, Carex leptalea, Carex prairea?, Carex utriculata, Carex viridula, Scirpus microcarpus var. rubrotinctus, Juncus alpinoarticulatus, Juncus tenuis var. dudleyi

FORBS
Lilium philadelphicum var. andinum, Smilacina stellatum, Smilacina trifolium, Zigadenus elegans subsp. elegans, Cypripedium calceolus var. parviflorum, Habenaria dilatata, Habenaria hyperborea, Habenaria obtusata, Spiranthes romanzoffiana, Anemone canadensis, Ranunculus macounii, Thalictrum occidentale var. occidentale, Thalictrum venulosum var. venulosum, Mitella nuda, Fragaria virginiana var. glauca, Geum macrophyllum var. ?macrophyllum, Rubus pubescens, Glycerrhiza lepidota var. lepidota, Vicia americana var. americana, Viola nephrophylla, Epilobium leptophyllum, Aralia nudicaulis, Cicuta maculata var. angustifolia, Osmorhiza depauperata, Sancula marilandica, Cornus canadensis, Pyrola asarifolia var. asarifolia, Pyrola chlorantha, Dodecatheon pulchellum subsp. pulchellum, Lysimachia ciliata, Lysimachia thyrsiflora, Menyanthes trifoliata, Lycopus americanus, Lycopus asper, Mentha arvensis var. glabrata, Scutellaria galericulata var. pubescens, Pedicularis groenlandica, Plantago major var. major*, Galium boreale var. intermedium, Galium trifidum var. trifidum, Galium

triflorum, Linnaea borealis var. americana, Aster borealis, Aster ciliolatus, Aster laevis var. geyeri, Crepis runcinata subsp. runcinata, Crepis tectorum*, Senecio pauperculus, Solidago canadensis var. canadensis, Sonchus uliginosus*, Taraxacum officinale*

(Additionally, Gentiana fremontii may have been reported but confirmation is required.)